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U.S. WAR DEPARTMENT

TECHNICAL MANUAL



20-MM AIRCRAFT GUN MATÉRIEL
M1 AND M2

April 2, 1942

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WAR DEPARTMENT,
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20-MM AIRCRAFT GUN MATÉRIEL M1 AND M2

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*This manual supersedes T. M. 9-227, December 16, 1941.

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SECTION I

GENERAL

Paragraph

Scope-----	1
Data-----	2

1. **Scope.**—*a.* This manual is published for the information and guidance of the using arms and services.

b. In addition to a description of the 20-mm aircraft gun matériel M1 and M2, this manual contains technical information required for the identification, use, and care of the matériel.

c. Disassembly, assembly, and such repairs as may be handled by using arms personnel will be undertaken only under the supervision of an officer or the chief mechanic.

d. In all cases where the nature of the repair, modification, or adjustment is beyond the scope or facilities of the unit, the responsible ordnance service should be informed in order that trained personnel with suitable tools and equipment may be provided, or proper instructions issued.

2. **Data.**

Length of gun-----	inches--	98.5
Weight of gun without magazine-----	pounds--	112.6
Velocity-----	feet per second--	2,850
Rate of automatic fire-----	shots per minute--	600-700
Length of tube-----	inches--	67.52
Weight of tube-----	pounds--	94.5

Number of grooves.....	9
Depth of grooves.....inches.....	.015
Width of grooves.....do.....	.205
Width of lands.....do.....	.068
Rifling is uniform with right hand twist, slops 7°.	
Maximum powder pressure.....pounds per square inch.....	42,000

SECTION II

DESCRIPTION

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3. 20-mm gun M2.—*a.* The 20-mm, 2,850-fps automatic gun M2 is a combination gas and blowback operated aircraft weapon. The gun is air-cooled and is capable of delivering fire at the rate of 600-700 rounds per minute. Designed for mounting on “in-line” airplane engines, it may be fired either through the hub of the propeller or as a fixed gun mounted in the wing (figs. 1, 2, and 3).

b. The gun consists of two distinct portions, recoiling and non-recoiling. Recoil is absorbed partly by a muzzle brake and partly by a recoil spring placed between the muzzle brake and the front mount. The recoil spring serves also as a recuperating spring. Its assembled height can be varied by turning the mounting sleeve nut. The muzzle brake is of the conventional type except as to its internal construction, which is fundamentally similar to that of a compensator. A number of ports are cut in the muzzle brake which, being at an angle of 45° to the axis of the bore, deflect the blast gases to the rear. The tendency of the reaction is to force the gun to the front and reduce the total recoil energy (fig. 5).

(1) *Nonrecoiling portion.*—The nonrecoiling portion consists of the front mounting sleeve assembly. A dashpot cylinder is attached to the mounting sleeve to act as a guide for the dashpot piston during the normal recoil of about 1 inch.

(2) *Recoiling portion.*—(*a*) The tube is screwed into the receiver body and secured by a locking pin to prevent the barrel from becoming loose due to vibration. It is fitted with a muzzle brake, recoil spring, mounting sleeve, and a gas cylinder. The gas cylinder is open at the end and contains the gas piston. The gas cylinder sleeve houses a spring and carries a yoke on its rear end which contacts two push rods passing through the front end of the receiver and abutting the forward ends of the breechblock slides. The cylinder is fixed to the gun barrel but the piston is free to move to the rear.

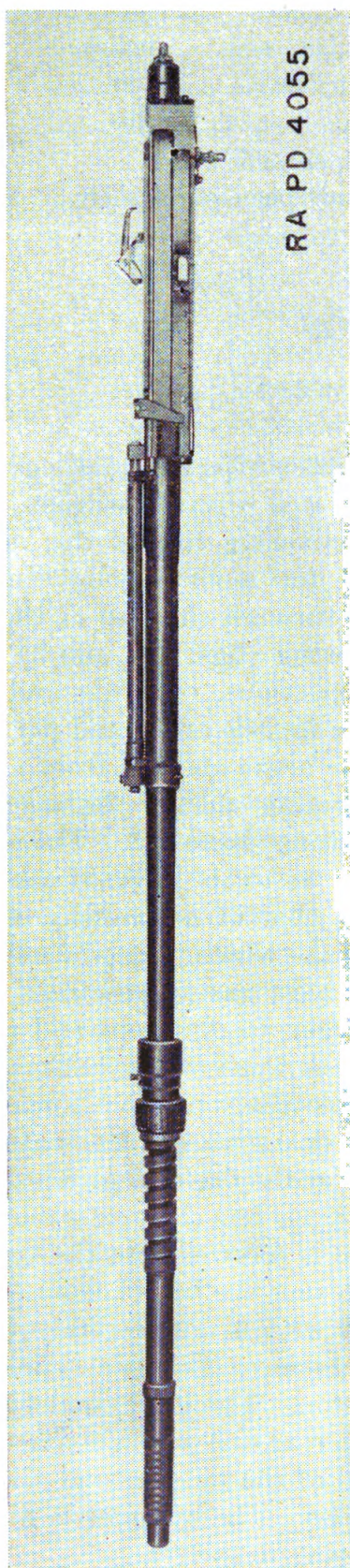


FIGURE 1.—20-mm automatic gun M2, general assembly, left-side view.

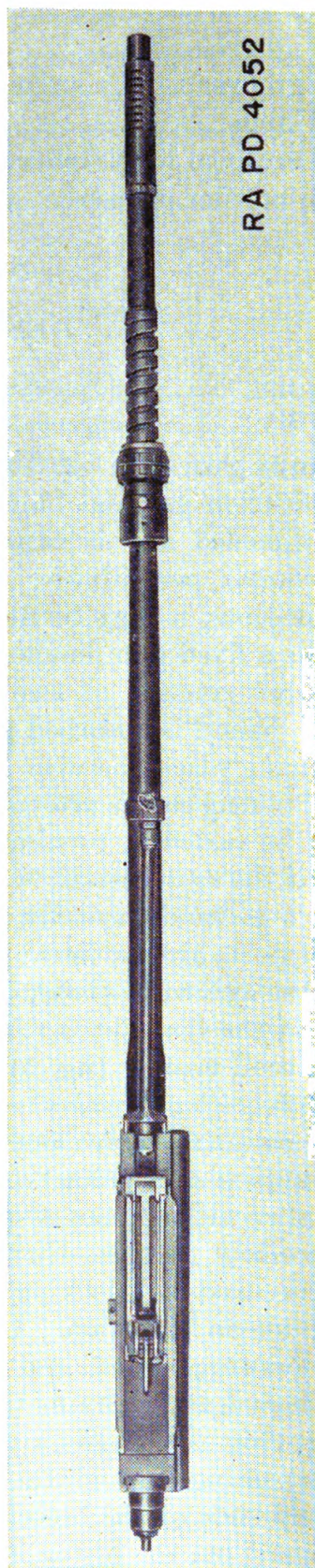


FIGURE 2.—20-mm automatic gun M2, general assembly, top view.

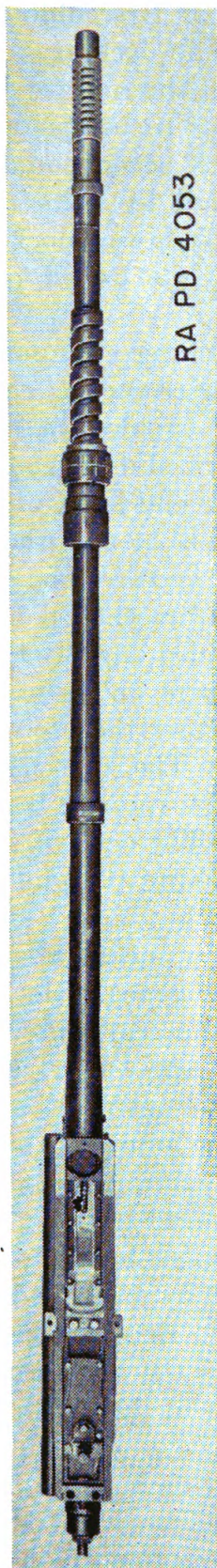


FIGURE 3.—20-mm automatic gun M2, general assembly, bottom view.

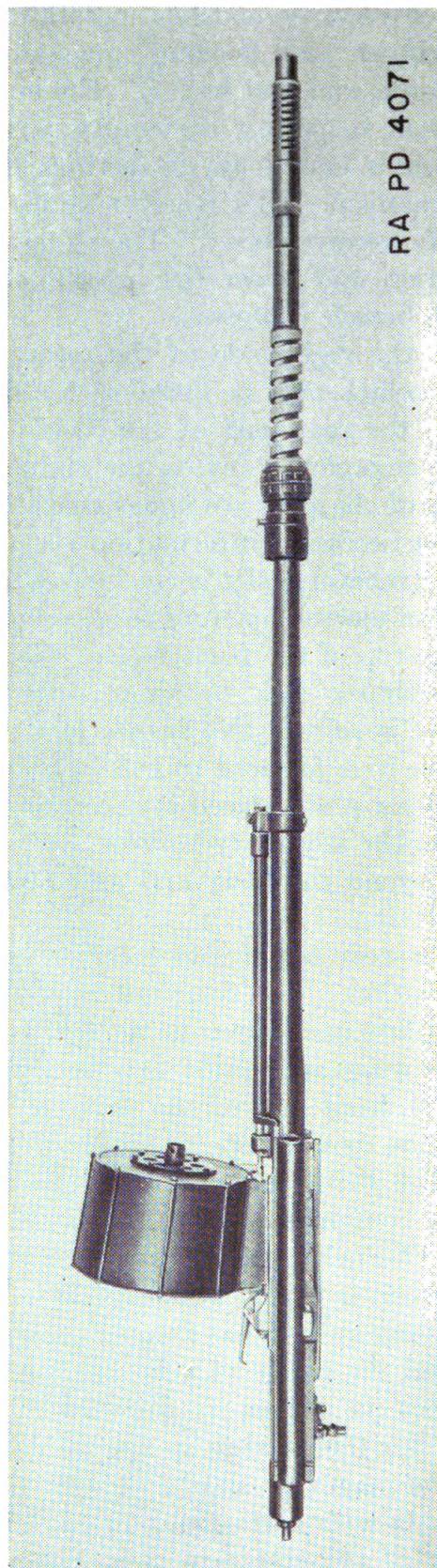


FIGURE 4.—20-mm automatic gun M1, general assembly, right-side view with 60-round magazine.

(b) The receiver houses the following groups: Breechblock, sear block, trigger and housing, magazine and slide locking, driving spring guide, and rear buffer. The under side of the receiver is open at the front to permit the empty cartridge cases to be ejected. At the rear it is closed by the bottom plate, which accommodates the sear mechanism. The receiver slides are secured by bolts to each side of the receiver body. The slides support the breechblock in firing position and lower the breechblock lock to the locked position when the breech is closed.

(c) In the right side of the receiver is a cocking cylinder (figs. 6 and 7) which may be fitted with a charger for retracting the bolt. A slot in the rear half of the cocking cylinder enables the cocking piston to engage the key on the right breechblock slide. At present two types of chargers are under consideration, air and hydraulic. As soon as the necessary information is available it will be published.

(d) A transverse slot is cut in each side of the receiver body to the rear of the ejector opening to accommodate the breechblock locking key. The top of the front face of the key is beveled slightly to allow the breechblock lock to hinge down and engage in front of it. Below the bevel are two projections which support the breechblock lock when it is lowered to the locked position. The key is held in position by a plate placed between the sides of the receiver body and secured to the key by two screws and washers. The ends of the key project beyond the body and are used for attaching the gun to the rear mounting.

(e) The rear buffer and receiver are joined by means of a dovetail connection. The rear buffer lock plunger engages a slot in the receiver plate and prevents vertical sliding of the rear buffer. The driving spring and guide extend through the rear buffer into the bolt. The front end of the driving spring rests against the flange head of the driving spring guide plunger. The plunger abuts the rear of the firing pin. The rear end of the driving spring rests against a combination plug and guide screwed into the rear of the buffer. The cylindrical portion of the rear buffer houses a buffer spring which is placed under initial compression by a screwed buffer sleeve having an internal flange at the outer end. Between the buffer spring and the flange is a washer which absorbs the blow when the breechblock is driven to the rear. The rear of the cylinder is threaded for the driving spring guide assembly.

(f) The magazine slide is a steel forging having a guide on each side to mate with corresponding guideways on the receiver body. At the front of the slide are two hook-shaped projections to hold the

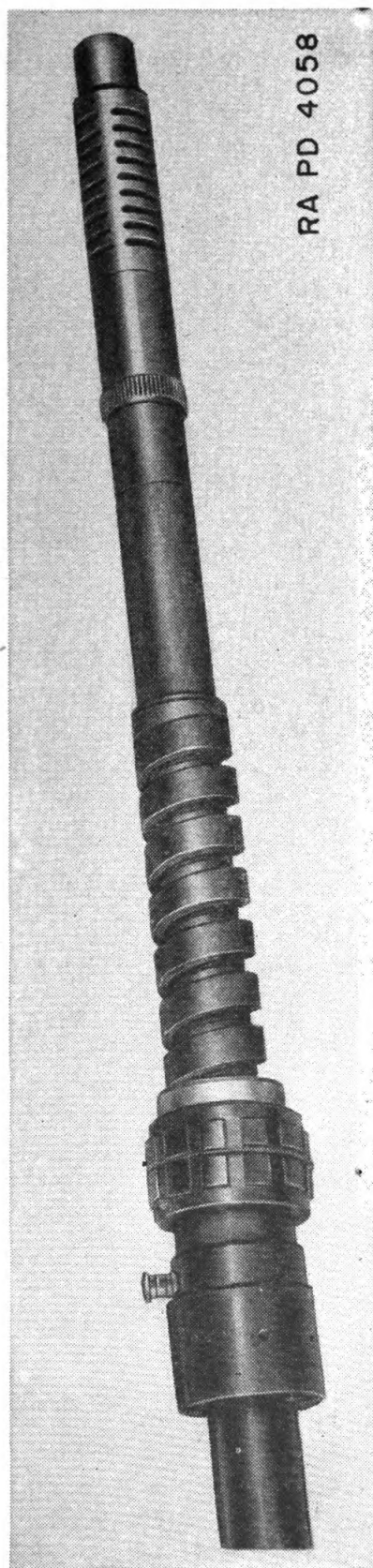


FIGURE 5.—20-mm automatic gun M2, recoil mechanism assembly, close-up.

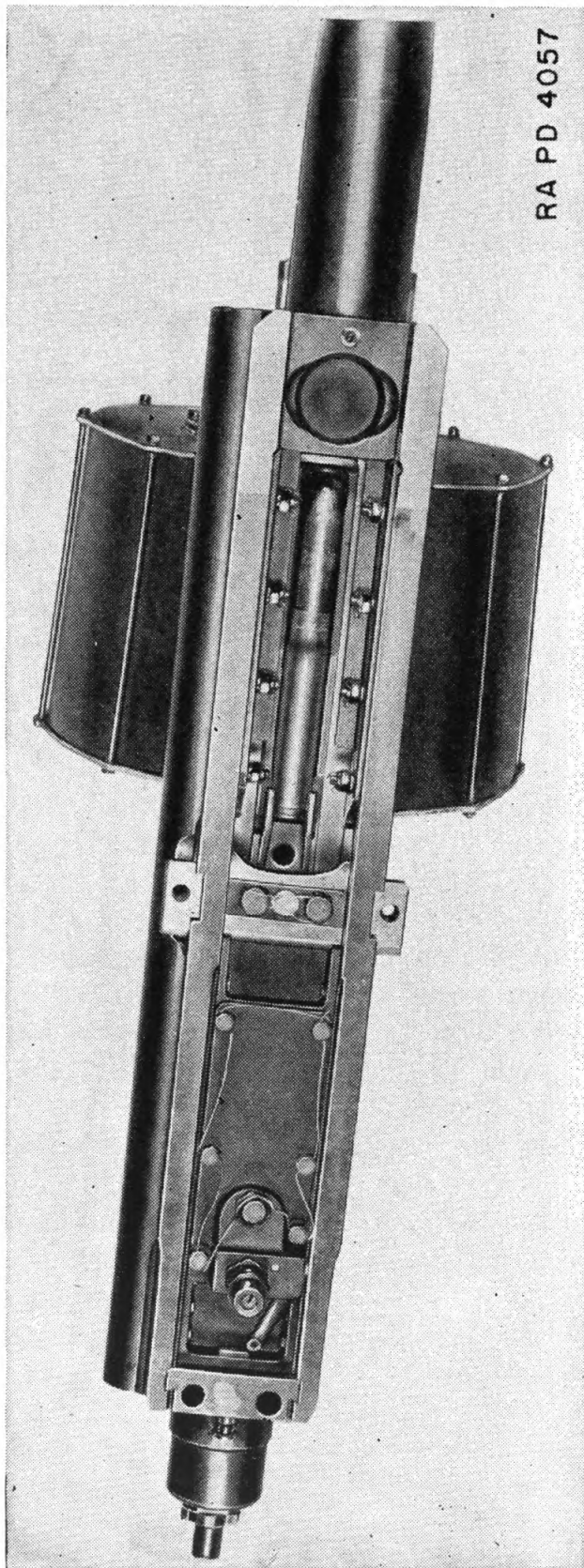


FIGURE 6.—20-mm automatic gun M2, bottom view, cocked position, close-up.

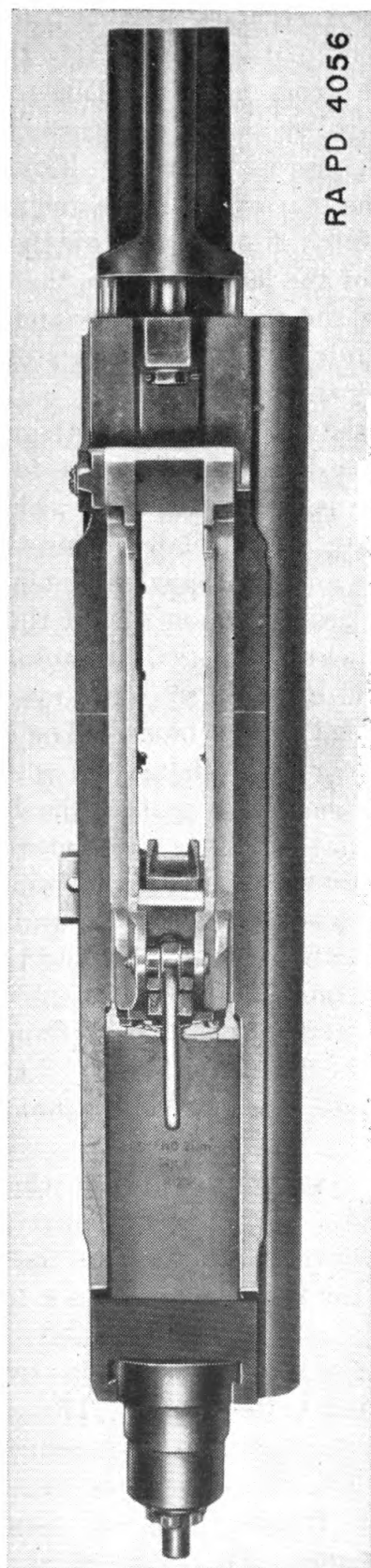


FIGURE 7.—20-mm automatic gun M2, top view, cocked position, close-up.

magazine in position. A securing arm is fitted to the left side of the slide. The lower end of the arm fits into the rear mounting and prevents the magazine from moving. Lines are engraved on the magazine slide and receiver body, and these lines should be made to coincide when the gun is mounted. The magazine latch and ejector are housed in the rear of the magazine slide.

(g) The magazine latch fits on top of the ejector. Two holes are drilled in the rear of the latch to house the latch springs. A circular recess is cut near the middle of the latch to accommodate the lug of the magazine slide lever. The front of the latch is beveled at the top for engaging the magazine.

(h) The ejector consists of two horns integral with a steel plate. The plate has two holes drilled in the rear for the ejector springs. Between the holes there is a threaded stud which passes through the magazine slide backplate. This plate forms the rear abutment for both the ejector springs and the magazine latch springs.

(i) The breechblock assembly consists of the breechblock, breechblock slides, firing pin, extractor, and breechblock lock. The slides, one on each side of the breechblock, are keyed together through a slot near the forward end of the block. The breechblock slide key rests in a transverse recess in the firing pin so that the latter and the slides move together. The slides contact the breechblock lock with such cammed surfaces that when the slides move forward the breechblock lock is cammed down. This occurs when the breechblock is fully forward. Inertia blocks are provided and housed in the breechblock slides in the longitudinal slots. The inertia blocks are cut away on the under side to accommodate the breechblock slide springs and guides, and are drilled at the front for a plunger and spring. The plunger bears against the front of the slot in the slide. A recess in the plunger accommodates the pin which holds it in position and limits its movement.

(j) The extractor is accommodated in the under side of the breechblock and pivots on its pin. It is provided with a lip at the front to engage the groove at the base of the cartridge case. The extractor spring forces the lip of the extractor toward the face of the breechblock.

(k) The sear block group consists of the sear, sear block, buffer springs and plungers, and buffer blocks. The group is housed in the bottom plate and is retained by the pressure of the sear buffer springs. The sear is hinged to the rear of the sear block. Two holes are drilled in the front of the sear block to house the sear buffer springs and plungers. The plungers are cylindrical in shape

and have a circumferential groove midway to accommodate the disassembling tool. The tool is passed through a vertical hole in the block and holds the springs under compression during disassembling or assembling. The sear buffer blocks, one of steel and one of fiber, provide a front abutment for the sear buffer springs and plungers. The steel buffer block should be adjacent to the plungers. The function of the sear buffer springs is to absorb the shock when the breechblock and sear engage.

(l) The sear block group is covered by the sear cover plate assembly. The sear is held up by the action of the sear spring and engages the breechblock in cocked position. When the safety lever is released, the sear is free to move, except for the action of the sear spring plunger which holds it up. When the trigger lever is pulled by the wire core of the trigger cable, the sear is pulled down against the action of the sear spring. This causes the bolt to move forward under the force of the driving spring.

4. **20-mm gun M1.**—The only differences between the M2 and M1 guns are in the dimensions and shapes of some of the receiver parts. The M2 receiver is slightly longer. In the 20-mm gun M2 the receiver slide bolts are locked by cotter pins and in the 20-mm gun M1 by locking wire. Each receiver slide in the 20-mm gun M1 has a head flange which overlaps the bottom face of the receiver side. In the 20-mm gun M2 each receiver slide has a projection which fits into a slot in the receiver side.

SECTION III

OPERATION

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Functioning of gun.....	7

5. **To load 60-round magazine.**—*a.* Place the magazine on the magazine stand, mouth up.

b. Introduce a rod into the holes in the end of the magazine spring axis.

c. Turn the axis so that the spring is depressed just enough to allow the insertion of a single cartridge.

d. Slide the cartridge, rim first, between the lips of the magazine.

e. Continue rotating the axis and filling the magazine with cartridges until 60 have been inserted.

Caution: Be sure that the head of each cartridge abuts the rear of the magazine. This is necessary to prevent misfeeds.

6. To load gun from 60-round magazine.—*a.* Fit the charger to the cocking cylinder and cock the gun.

b. Set the safety control lever at the safe position. Make sure that no pressure on the trigger has any effect.

c. Place the loaded magazine in its proper position on the gun.

d. Engage the two pins at the front of the mount with the hook-shaped projections at the front of the magazine carrier.

e. Depress the magazine catch lever and press the rear of the magazine into position.

f. Release the magazine catch lever and make sure that the catch engages the catch piece on the magazine.

7. Functioning of gun.—*a.* To enable the first round to be loaded and fired, open the breech and cock the gun with a cocking unit. When the cocking piston is forced to the rear, the head of the piston engages the key on the right breechblock slide, causing both the right and left slides to move to the rear and compress the slide springs. The first movement of the breechblock slide key withdraws the firing pin inside the breechblock, while the breechblock lock is still in the locked position. When the slides have traveled about $\frac{1}{2}$ inch, the lock is raised from the locked position and the breechblock is free to move to the rear.

b. Further movement of the cocking piston causes the breechblock slide key to pull the breechblock to the rear, compressing the driving spring. The movement of the breechblock is arrested when its rear end hits the rear buffer washer. Toward the end of its movement, the breechblock overrides the sear, which afterward rises under the influence of its spring and engages the breechblock lock in the cocked position.

c. When the firing control mechanism is operated, the sear is disengaged and the driving spring returns the breechblock assembly to the forward position. As the breechblock moves forward, it meets the base of a round in the mouth of the magazine and pushes the round into the chamber. When the breechblock is home, the extractor engages the groove in the cartridge case near the base. The final movement of the breechblock carries the breechblock lock to the locked position in front of the breechblock locking key. The breechblock slides continue to move forward until the firing pin protrudes through the breechblock face and strikes the primer. Rebound of the slides is prevented by their springs and the inertia blocks.

d. The breechblock remains locked until after the projectile has passed the gas vent. When the projectile has passed the gas vent in the barrel, a portion of the propellant gases passes into the gas

cylinder, where it impinges on the head of the piston and drives the piston to the rear. The rearward movement of the piston compresses the gas cylinder sleeve spring against the gas cylinder guide. As the piston moves to the rear, its yoke forces the gas cylinder sleeve push rods rearward. The push rods act against the breechblock slides to unlock the breech as described in the initial cocking.

e. When the breech is unlocked, the residual pressure in the bore acting against the empty cartridge case drives the breechblock to the rear, compressing the driving spring. The extractor supports the empty cartridge case on the face of the breechblock until it meets the ejector, which forces the case downward through the ejector opening. The backward movement of the breechblock is arrested by the rear buffer. The breechblock is then started forward by the recovery of the buffer. If the firing control mechanism is operated, the cycle of operations is repeated. If the firing control mechanism is released, the sear will retain the breechblock in the cocked position.

SECTION IV

DISASSEMBLY AND ASSEMBLY

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Assembly and replacement-----	9

8. Disassembly of groups.—*a. Muzzle brake and gas cylinder group.*—(1) Unscrew the front ferrule of the muzzle brake and the muzzle brake assembly. Straighten the muzzle brake washer and unscrew the rear ferrule from the muzzle brake. Further disassembly of the muzzle brake is prohibited.

(2) Remove the muzzle brake lock and slide off the recoil spring sleeve, the recoil spring, and the filler sleeve. The muzzle brake collar shown in figure 9 is used on a different mount only.

(3) Slide off the mounting sleeve assembly, and unscrew the plug with the fitting. Remove dashpot piston and washer, unscrew the dashpot cylinder from the mounting body, and remove the nut and detent.

(4) Cut the locking wire and unscrew the gas cylinder bracket plug and gas cylinder vent plug. Retract the gas cylinder sleeve and remove the gas cylinder and piston (fig. 8).

b. Receiver group.—(1) Remove the locking wire and the breechblock locking key plate screws, washers, and plate. Drive out the breechblock locking key.

(2) Take out the cotter pins, remove the receiver slide bolts with the nuts and washers, and lift off the receiver slides. In the case of

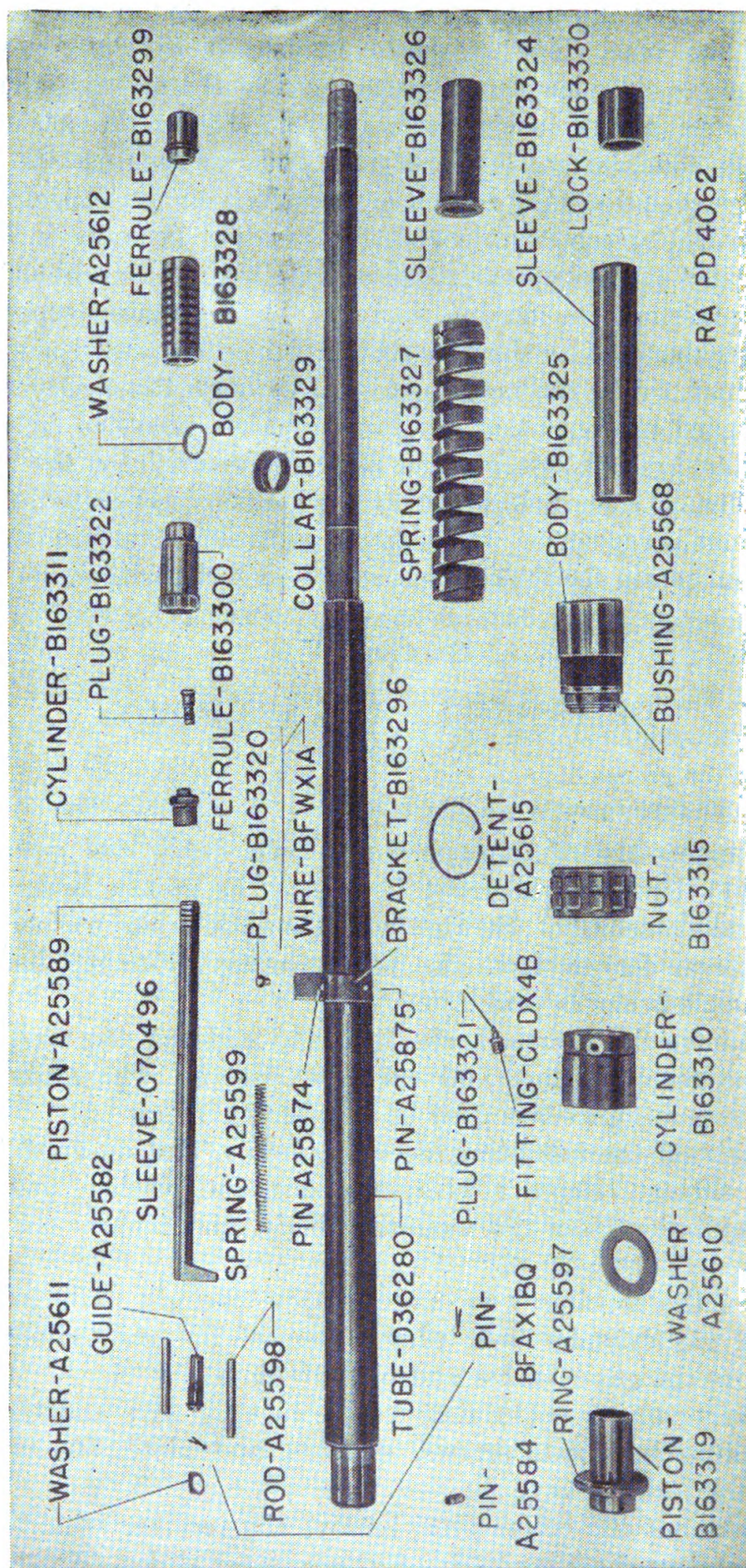


FIGURE 8.—20-mm automatic gun M2, barrel, muzzle brake, and gas cylinder group parts with locking collar.

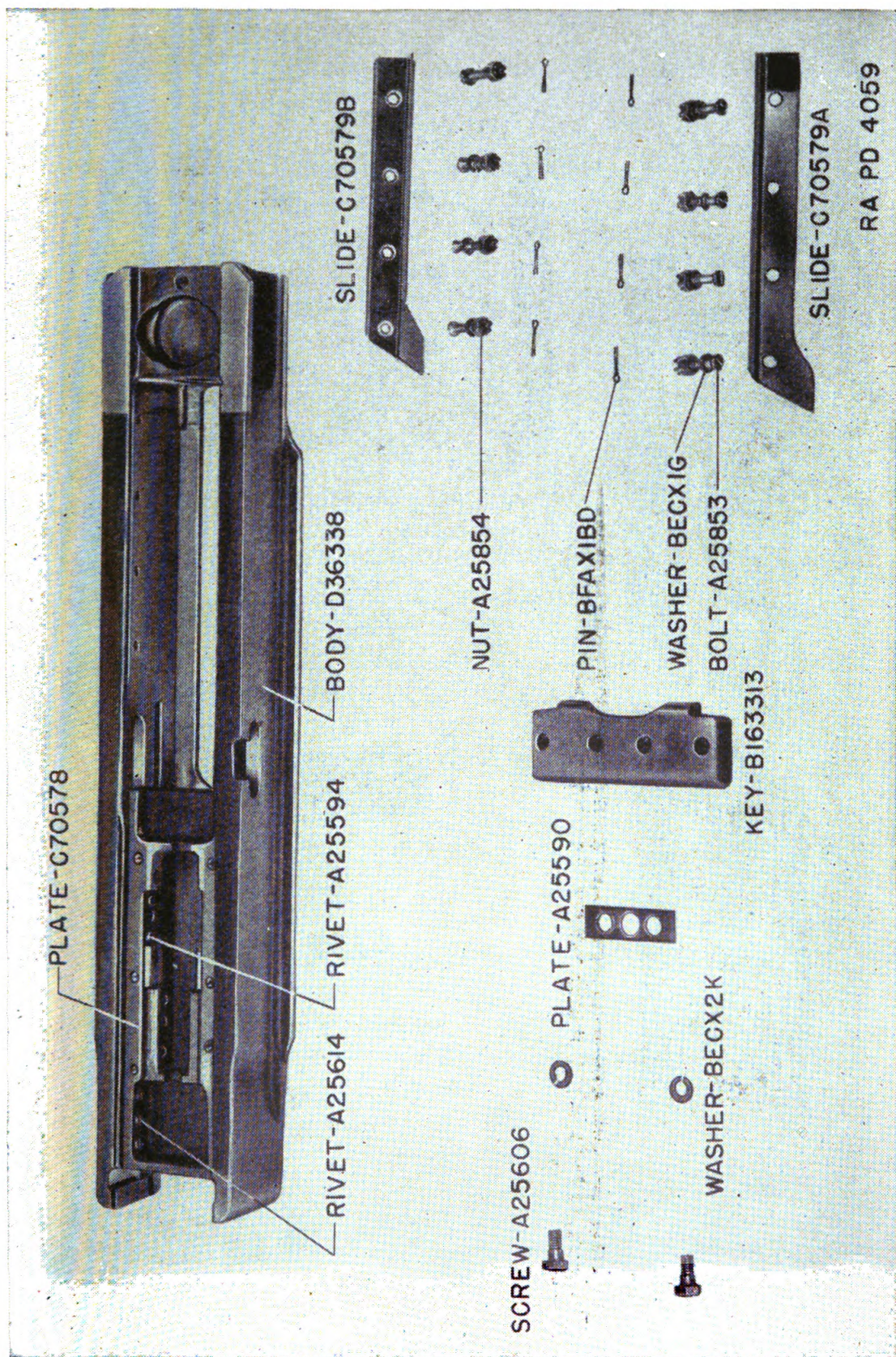


FIGURE 9.—20-mm automatic gun M2, receiver group parts.

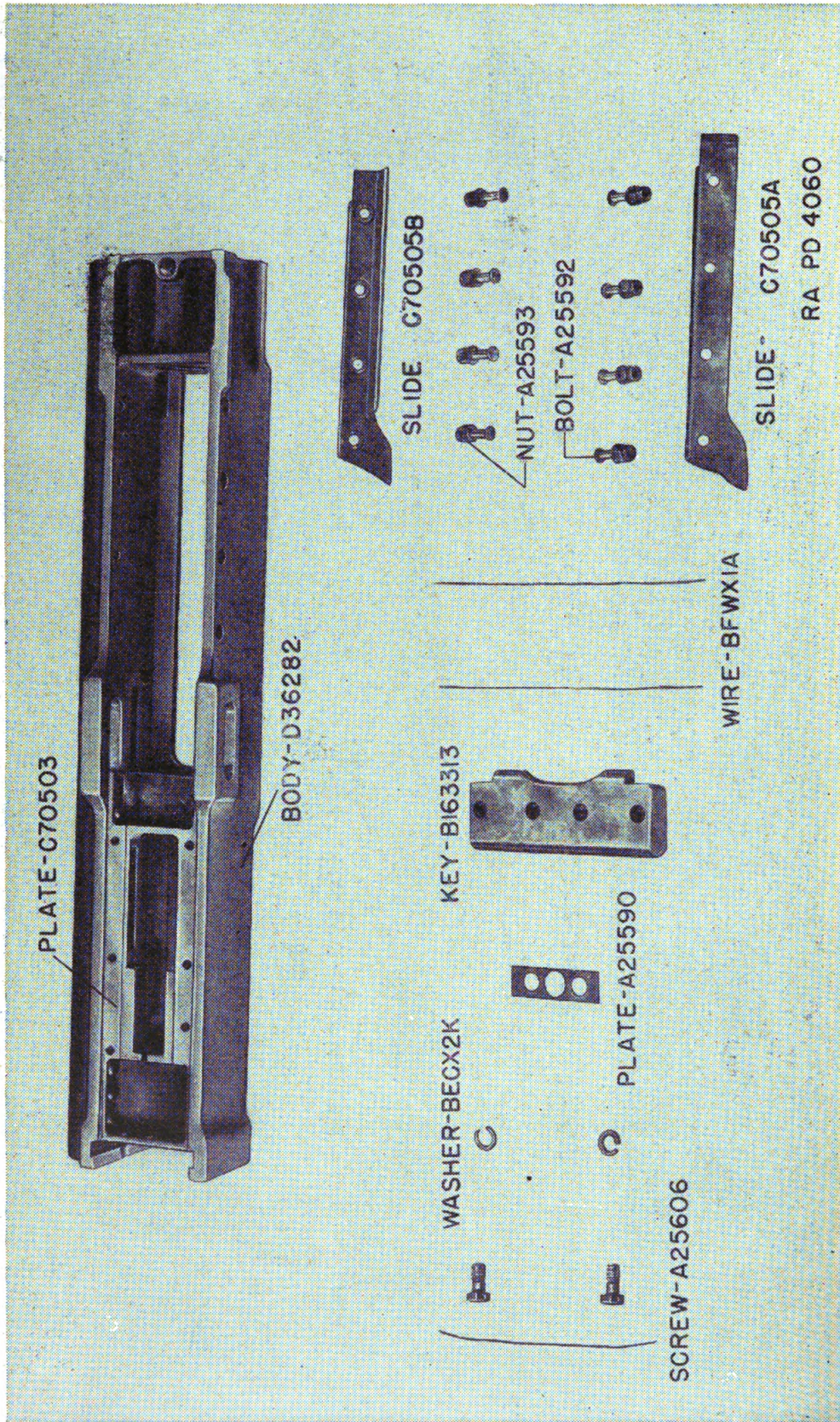


FIGURE 10.—20-mm automatic gun M1, receiver group parts.

the M1 gun, remove the locking wires, unscrew the slide bolts, with the nuts, and lift off the slides (figs. 9 and 10).

c. Magazine and slide locking group.—(1) Remove the cotter pin, unscrew the ejector stud nut, and remove the washers and the ejector with the springs.

(2) Remove the locking wire, unscrew the magazine slide backplate screws, and remove the backplate with the magazine latch springs. Remove the split pin and bushing, the magazine slide lever, and the latch.

(3) Remove the cotter pin and the magazine slide securing arm screw with the washer. Remove the magazine slide securing arm and slide off the magazine slide (fig. 11).

d. Breechblock group.—Unlock and remove the breechblock group from the gun. Remove the inertia blocks by pushing against the rear end of the block from the inside. Remove the retaining pin and the plunger and spring. Remove the breechblock slides, taking care to restrain the springs. Remove the breechblock slide spring guides. Remove the firing pin. Grip the extractor, drive out the extractor pin, and remove the extractor and spring (fig. 12).

e. Sear block group.—Insert a rod into the hole of the sear block, lift out the sear and sear block, and detach the sear from the sear block. Place the sear block in a vise so that the tension of sear buffer springs can be taken off the rod. Remove the rod and loosen the vise to release the tension of these springs (fig. 13).

f. Trigger and housing group.—To remove the trigger and housing group from the gun, remove the locking wire. Unscrew the sear cover plate screws, taking care to hold the plate firmly against the pressure of the sear spring as the screws are removed. Remove the plate.

(1) Unscrew sear spring housing and remove sear spring and plunger. Unscrew bowden connection nut and remove bowden connection outer and inner bushings. Unscrew bowden shaft housing nut and remove bowden connection shaft spring and shaft (fig. 14).

(2) Remove safety lever pin and safety lever. Remove safety trigger pin and the locking pin spring with the ball.

g. Rear buffer assembly.—To remove the driving spring and rear buffer group from the gun, see that the bolt is completely locked (in its most forward position). Unscrew the driving spring guide, and remove the guide and driving spring. Retract the rear buffer lock plunger and slide out the rear buffer.

(1) Remove the rear buffer lock plunger pin and slide out the plunger and spring, collar, and bushing.

(2) Unscrew the rear buffer sleeve and remove the spring and washer (fig. 15).

9. Assembly and replacement.—Assembly and replacement are in the reverse order of disassembly and removal. Prior to assembly, all

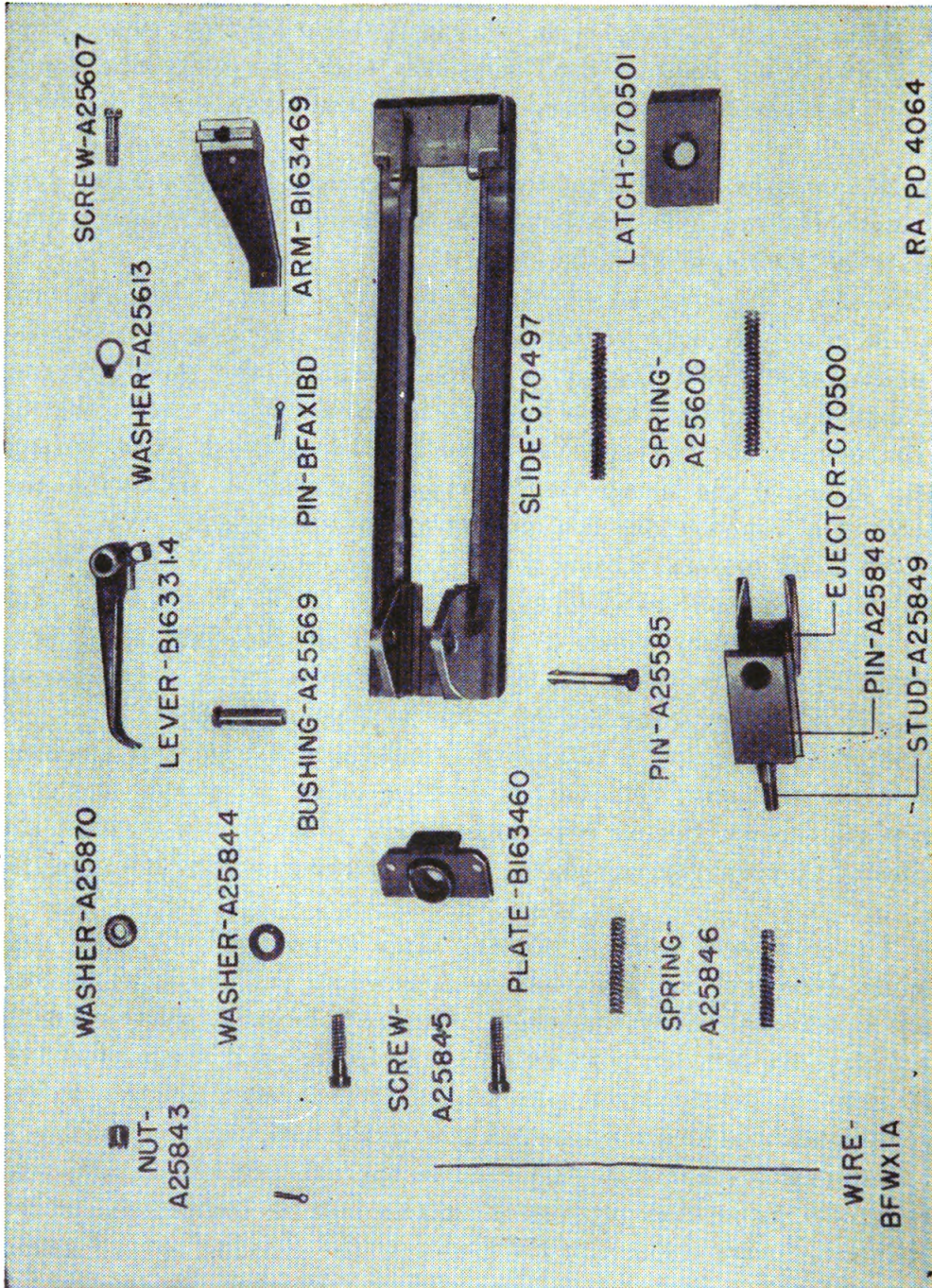


FIGURE 11.—20-mm automatic gun M2, magazine and slide locking group parts.

parts must be free of dirt, rust, and other extraneous matter. Metal parts in contact must be covered with a light film of lubricating oil.

Caution: In assembling the sear assembly, replace the springs and fingers in the sear block, and place the block in a vise so that the

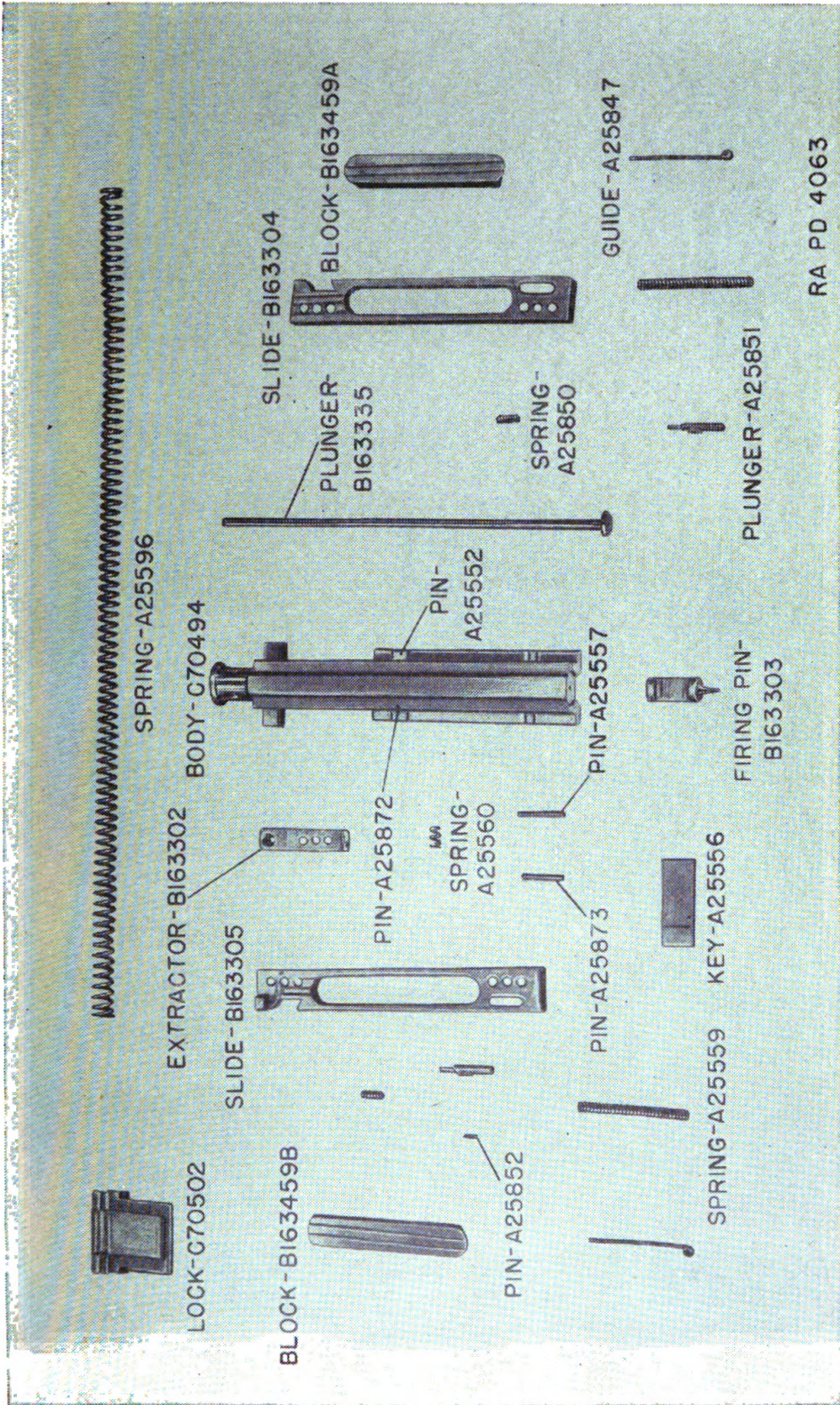


FIGURE 12—20-mm automatic gun M2, breechblock group parts.

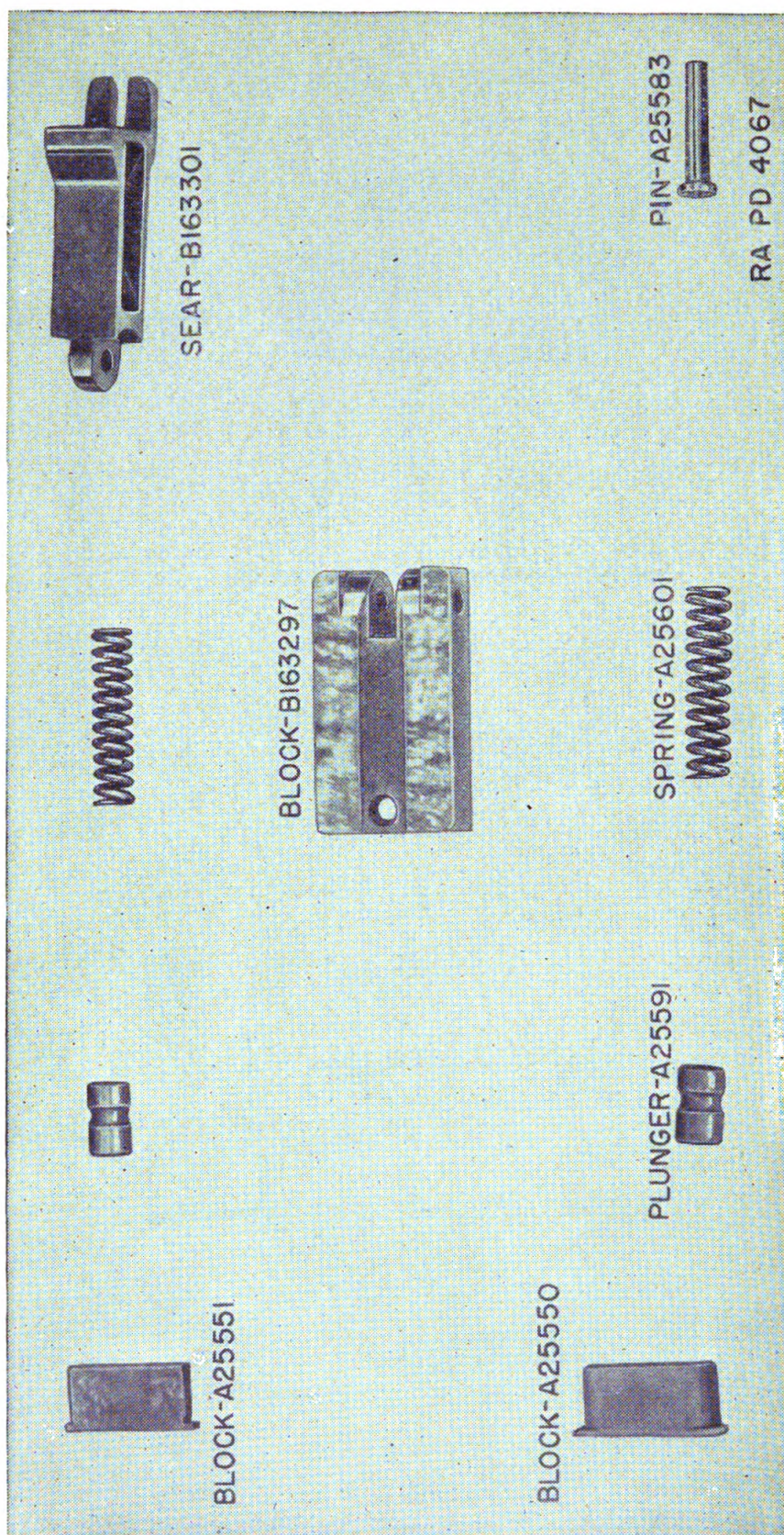


FIGURE 13.—20-mm automatic gun M2, sear block group parts.

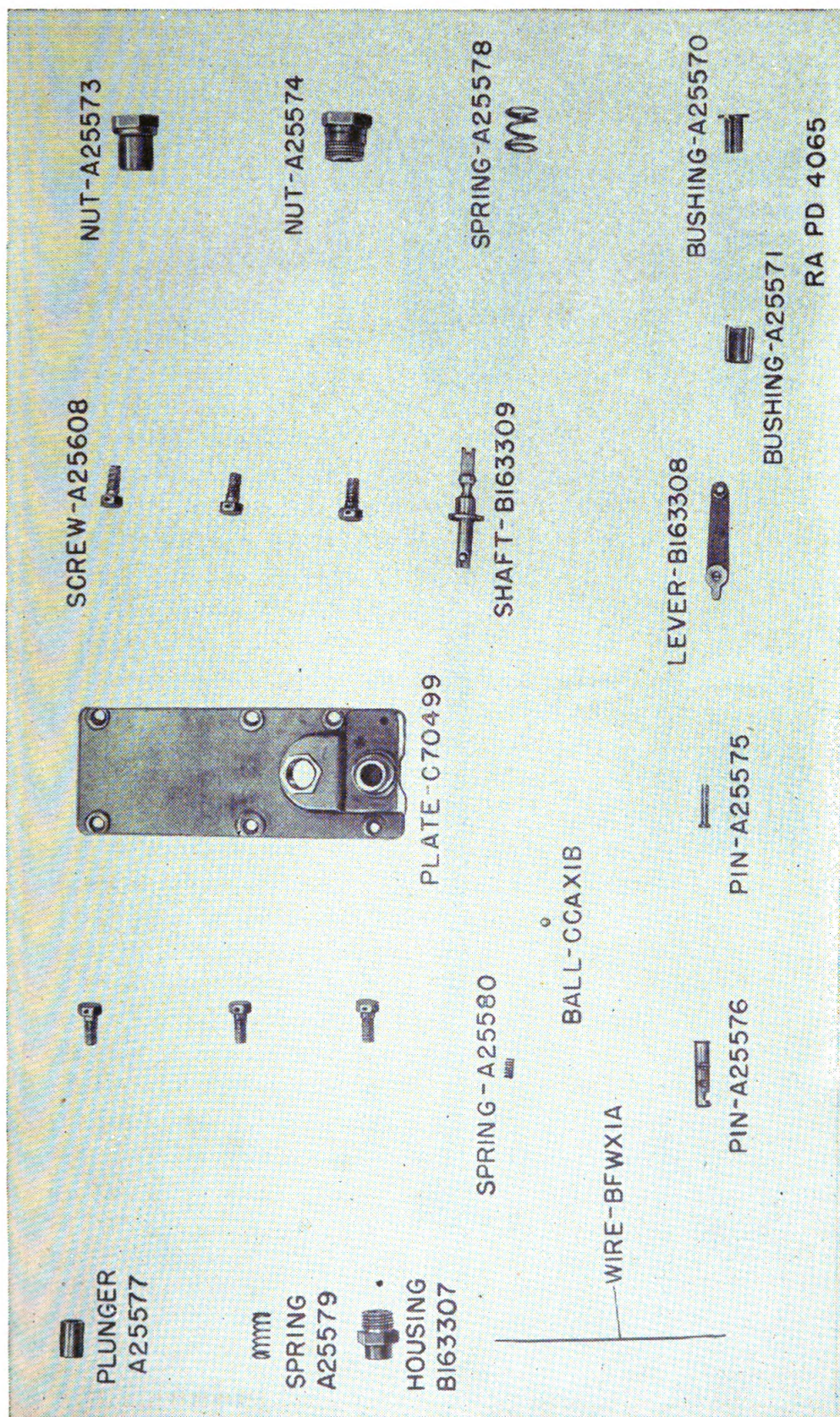


FIGURE 14.—20-mm automatic gun M2, trigger and housing group parts.

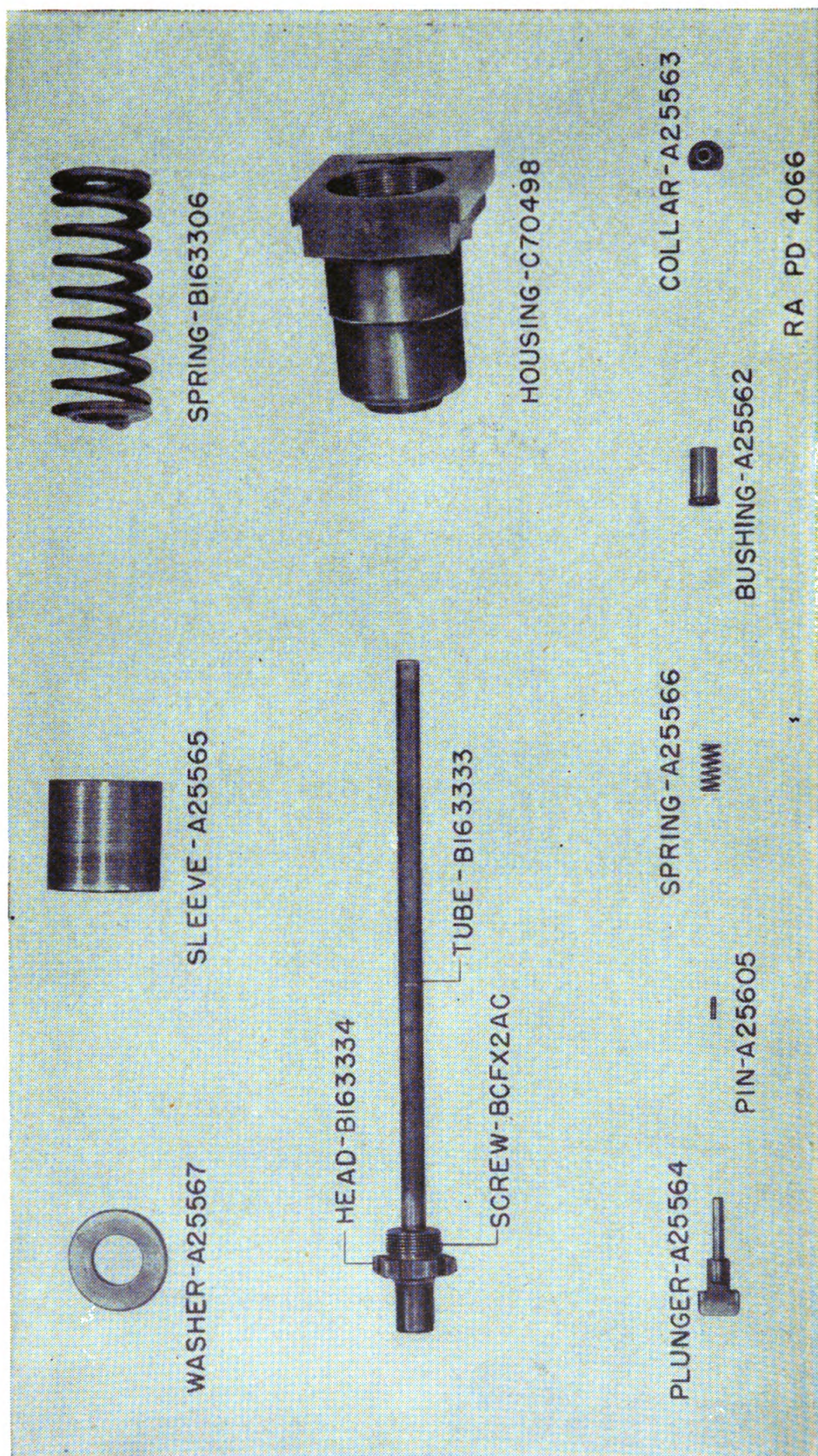


FIGURE 15.—20-mm automatic gun M2, driving spring guide and rear buffer group parts.

plungers are forced inward. Insert a rod in the sear block hole so that it engages the circumferential grooves on the plungers and prevents their movement. Do not remove the rod until the sear has been attached and the sear assembly replaced.

SECTION V

CARE AND PRESERVATION

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Lubrication instructions-----	11

10. Care of gun.—In all maintenance operations the gun should be disassembled, thoroughly cleaned, and oiled. Special care should be taken in cleaning the gas port in the tube and the gas cylinder. After the gun has been cleaned it should be carefully dried and covered with a thin film of oil. If the gun is to be stored or shipped, it should be suitably coated with a rust-preventive compound after first cleaning with solvent, dry-cleaning.

11. Lubrication instructions.—*a.* Only the following cleaning, preserving and lubricating materials will be used in this equipment:

(1) *Lubricants.*—Oil, lubricating, for aircraft instruments and machine guns.

(2) *Cleaners.*—Cleaner, rifle bore and solvent, dry-cleaning.

(3) *Rust-preventive compound.*—Compound, rust-preventive, light.

b. To operate properly at all times, the gun should be periodically disassembled, thoroughly cleaned, and oiled. After firing, the exterior surfaces and all moving parts of the gun will be disassembled and thoroughly cleaned with solvent, dry-cleaning. The bore will be cleaned, with cleaner, rifle bore. After cleaning, the matériel will be given a thin protective coating of oil, lubricating, for aircraft instruments and machine guns. If the gun has not been fired but is in an alert condition, it should be cleaned daily with solvent, dry-cleaning, thoroughly dried, and a film of oil, lubricating, for aircraft instruments and machine guns applied.

c. When cleaning the gun it is important that the gas cylinder vent plug be removed, cleaned, and replaced. If after thorough cleaning the action of the gun remains sluggish, replace this plug with a new one.

SECTION VI

ORGANIZATION SPARE PARTS AND ACCESSORIES

	Paragraph
Organization spare parts-----	12
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12. Organization spare parts.—*a.* A set of organization spare parts is supplied to the using arm for field replacement of those parts

most likely to become broken, worn, or otherwise unserviceable. The set is kept complete by requisitioning new parts for those used. Organization spare parts are listed in SNL A-47.

b. Care of organization spare parts is covered in section V.

13. Accessories.—*a. General.*—Accessories include tools and equipment required for such disassembling and assembling as the using arm is authorized to perform, and for the cleaning and preservation of the gun carriage, sighting and fire-control equipment, ammunition, etc. They also include chests, covers, tool rolls, and other items necessary to protect the matériel when it is not in use, or when traveling. Accessories should not be used for purposes other than as prescribed, and when not in use should be properly stored. There are a number of accessories the names or general characteristics of which indicate their use. Others, embodying special features or having special uses, are described below.

b. Rod, cleaning.—The rod consists of a number of metal sections having male and female threads at opposite ends to enable the complete rod to be assembled. A T-shaped handle is fitted to one of the end sections to facilitate the use of the rod. The service sections include a brush, a plug end for use with patches, and a loop end for flannelette or other cleaning rags.

c. Tool, breechblock unlocking.—This lever with two arms pivoted at one end is designed to be placed on top of the bolt body in the receiver. A hook engages the end of the right receiver slide so that when the lever is operated the slides are forced rearward, unlocking the breechblock.

d. Tool, driving spring assembling.—This is a steel rod, in one end of which is screwed a split stud. This studded end is inserted in a recess in the outer end of the plunger (driving spring guide) to aid in assembling.

e. Tool, sear block assembling.—This vise-like tool is used to bring together, by compressing, the sear buffer springs and plungers (sear buffer spring) in their proper relation in the sear block in order that they may be inserted in the gun. This tool may also be used for releasing the springs from the sear block.

f. Tool, sear buffer spring retaining.—This is a rod bent to form an oval handle at one end; the straight portion at the other end is slightly tapered. This tool is used with the sear block assembling tool and when inserted in the hole of the sear block engages the grooves in the plungers (sear buffer spring), thus holding the springs under compression. When the tool is in this position, the mechanism can be moved as a group and inserted in its proper place in the gun.

g. Wrench, engineers, single-head.—This open end wrench is provided to fit the gas cylinder guide and the gas cylinder vent plug.

h. Wrench, muzzle brake.—This wrench is a casting with two handles diametrically opposite its round center portion, which has internal splines to engage the external splines of the muzzle brake when assembling and disassembling. It can also be used for assembling the muzzle thread protector.

i. Wrench, rear buffer.—This casting is designed with two handles diametrically opposite a central portion. One side of this central portion has a hexagon socket to fit the guide driving spring head. The other side of the casting is a circular section with four equally spaced projections on its outer periphery, which engage keyways cut in the face of the rear buffer spring sleeve.

j. Wrench, spanner.—This spanner is provided to tighten and loosen the mounting sleeve nut.

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14. General.—Ammunition for the 20-mm automatic guns M1 and M2 is issued in the form of fixed rounds, with the cartridge case containing the propelling charge and primer crimped rigidly to the projectile. The complete round is loaded into the gun as a unit. The fuzed complete round includes all the ammunition components used in the gun to fire once. After firing, the cartridge case is extracted and ejected, then the next round loaded into the gun, all automatically.

15. Firing tables.—No firing tables will be issued at present for these weapons. Data for use of personnel engaged in design of fire

control are furnished in the form of ballistic research laboratory reports.

16. Classification.—Dependent upon the type of projectile, the ammunition provided for this gun is classified as high-explosive incendiary, armor-piercing, or practice. The high-explosive incendiary projectile contains both a high explosive and an incendiary filler; the armor-piercing projectile is inert or contains a tracer; the practice projectile is inert.

17. Identification.—Ammunition, including components, is identified by means of painting, marking (including ammunition lot number), and the accompanying ammunition data card. All essential information may be obtained from the marking and the data card.

a. Mark or model.—To identify a particular design, a model designation is assigned at the time the design is classified as an adopted type. This model designation becomes an essential part of the standard nomenclature of the item and is included in the marking of the item. The model designation consists of the letter M followed by an Arabic numeral. Modifications are indicated by adding the letter A and the appropriate Arabic numeral. Thus, M1A1 indicates the first modification of an item for which the original model designation was M1. An exception exists in the case of 20-mm ammunition, the models of which are designated Mark, abbreviated "Mk.", followed by a Roman numeral.

b. Ammunition lot number.—When ammunition is manufactured, an ammunition lot number, which becomes an essential part of the marking, is assigned in accordance with pertinent specifications. This lot number is stamped or marked on each complete round, on all packing containers, and on the accompanying ammunition data card. It is required for all purposes of record, including reports on condition, functioning, and accidents, in which the ammunition is involved. To provide for the most uniform functioning, all of the rounds of any one lot of fixed ammunition consist of—

Projectiles of one lot number.

• Fuzes of one lot number.

Primers of one lot number.

Propellant powder of one lot number.

Therefore, to obtain the greatest accuracy in any firing, successive rounds should be from the same ammunition lot, whenever practicable.

c. Ammunition data card.—A 5- by 8-inch card, known as an ammunition data card, is packed in each packing box with the

ammunition. When required, assembling or firing instructions are printed on the reverse side of the card.

d. Painting and marking.—(1) *Painting.*—Projectiles are painted to prevent rust and, by means of the color, to provide for identification as to type. The projectiles of the ammunition described herein are painted as follows:

High explosive incendiary.	Yellow ogive, red body; marking in black.
Armor-piercing-----	Black; marking in white.
Practice-----	Black; marking in white (projectile is inert).

It should be noted that the above color scheme is not wholly in agreement with the basic color scheme described in TM 9-1900.

(2) *Marking.*—The following information is marked or stamped on the ammunition:

(a) *On projectile.*

Kind of filler, for example, HEI.
 Loader's lot number.
 Loader's initials and symbol.
 Year of loading.

(b) *On base of cartridge case.*

Lot number and loader's initials or symbol (stenciled).
 Caliber and designation.
 Manufacturer's initials or symbol.
 Year of manufacture.

(c) *On fuze.*

Model and designation of fuze.
 Manufacturer's initials or symbol.
 Loader's lot number.
 Year of loading.

18. Care, handling, and preservation.—Complete rounds and ammunition components are packed to withstand conditions ordinarily encountered in the field. Since ammunition is adversely affected by moisture and high temperature, due consideration should be given to the following:

a. Ammunition must be handled with proper care at all times. The explosive elements in primers and fuzes are particularly sensitive to undue shock and high temperature.

b. Do not break the moisture-resistant seal of the packing until the ammunition is to be used.

c. Do not attempt to disassemble any complete round or fuze.

d. Protect the ammunition from high temperatures, including the direct rays of the sun. More uniform firing is obtained if the rounds are at the same temperature.

e. The complete round should be free of any foreign matter—sand, mud, grease, etc.—before loading into the gun. If it gets wet or dirty it should be wiped off at once.

f. Rounds prepared for firing but not fired will be returned to their original packing and appropriately marked. These will be used first in subsequent firings, in order that stocks in opened packings may be kept at a minimum.

g. Do not handle duds. The fuzes of duds, the projectiles having been fired, are extremely dangerous. Duds will be disposed of in accordance with TM 9-1900.

19. Authorized rounds.—The ammunition authorized for use in the 20-mm automatic guns M1 and M2 is shown in the following table. Both models of the gun, the M1 and the M2, are chambered alike, hence fire the same ammunition. It will be noted that the nomenclature completely identifies the round.

TABLE I.—Ammunition for the 20-mm automatic guns M1 and M2

Nomenclature	Action of fuze	Approximate weight of projectile as fired (pounds)
<i>Service ammunition</i>		
Shell, fixed, HEI, Mk. I, w/fuze, percussion, DA, No. 253, Mk. I/A/, 20-mm automatic guns M1 and M2.	Supersensitive-----	0. 29
Shot, fixed, AP, M75, w/tracer, 20-mm automatic guns M1 and M2.	None-----	0. 29
<i>Practice ammunition</i>		
Shell, fixed, practice, Mk. I, 20-mm automatic guns M1 and M2.	None-----	0. 28

HEI—High explosive incendiary.

20. Preparation for firing.—The complete rounds as issued are ready for firing, it being necessary only to load the rounds into the feeder provided with the gun (see pars. 5 and 6).

21. Shell, fixed, HEI, Mk. I, w/fuze, percussion, DA, No. 253, Mk. I/A/, 20-mm automatic guns M1 and M2.—This complete

round, shown in figure 16, consists of a primer and a propelling charge contained in a cartridge case which is crimped rigidly to a fuze-d projectile, the fuze being of the supersensitive type. The projectile contains 0.03 pound of high explosive and incendiary filler. The round is 7.19 inches long and weighs 0.57 pound. The propelling charge weighs 0.07 pound.

22. Shot, fixed, AP, M75, w/tracer, 20-mm automatic guns M1 and M2.—The projectile of this round is of solid steel. It contains a tracer and is similar in shape to the high-explosive incendiary projectile. The weight of the projectile is 0.37 pound; the propelling charge, 0.07 pound; and the complete round, 0.64 pound.

23. Shell, fixed, practice, Mk. I, 20-mm automatic guns M1 and M2.—This round, figure 17, consists of a primer and a propelling charge contained in a cartridge case which is crimped rigidly to a projectile. The projectile of this round, used for practice purposes, contains no explosive and has no fuze. The projectile is similar in shape and ballistic properties to the point-fuzed high-explosive incendiary projectile described in paragraph 21. The round is 7.23 inches long and weighs 0.56 pound. The propelling charge weighs 0.07 pound.

24. Fuze, percussion, DA, No. 253, Mk. I/A/.—This fuze, a supersensitive type, is shown assembled to the projectile in figure 16. It is designed to function on impact with targets such as airplane surfaces, which offer little resistance. Like other fuzes used with small caliber ammunition, this fuze is classified as nonboresafe. See AR 750-10 for the definition of boresafe fuzes, and regulations for firing in time of peace.

Caution: Fuzes will not be disassembled. Any attempt to disassemble fuzes in the field is dangerous and is prohibited except under specific directions of the Chief of Ordnance.

25. Packing and marking.—*a. Packing.*—The ammunition for this gun is packed 10 rounds per fiber carton, figure 18, and 12 cartons (120 rounds) per sealed metal-lined packing box, figure 19. The following data are considered representative for estimating weight and volume requirements:

	Weight (pounds)	Volume (cubic feet)
Complete round, HEI, w/o packing material-----	0.57	
Complete round, AP, w/o packing material-----	0.64	
Complete round, practice, w/o packing material--	0.56	
120 HEI rounds in fiber containers in metal-lined packing box-----	94.5	1.40

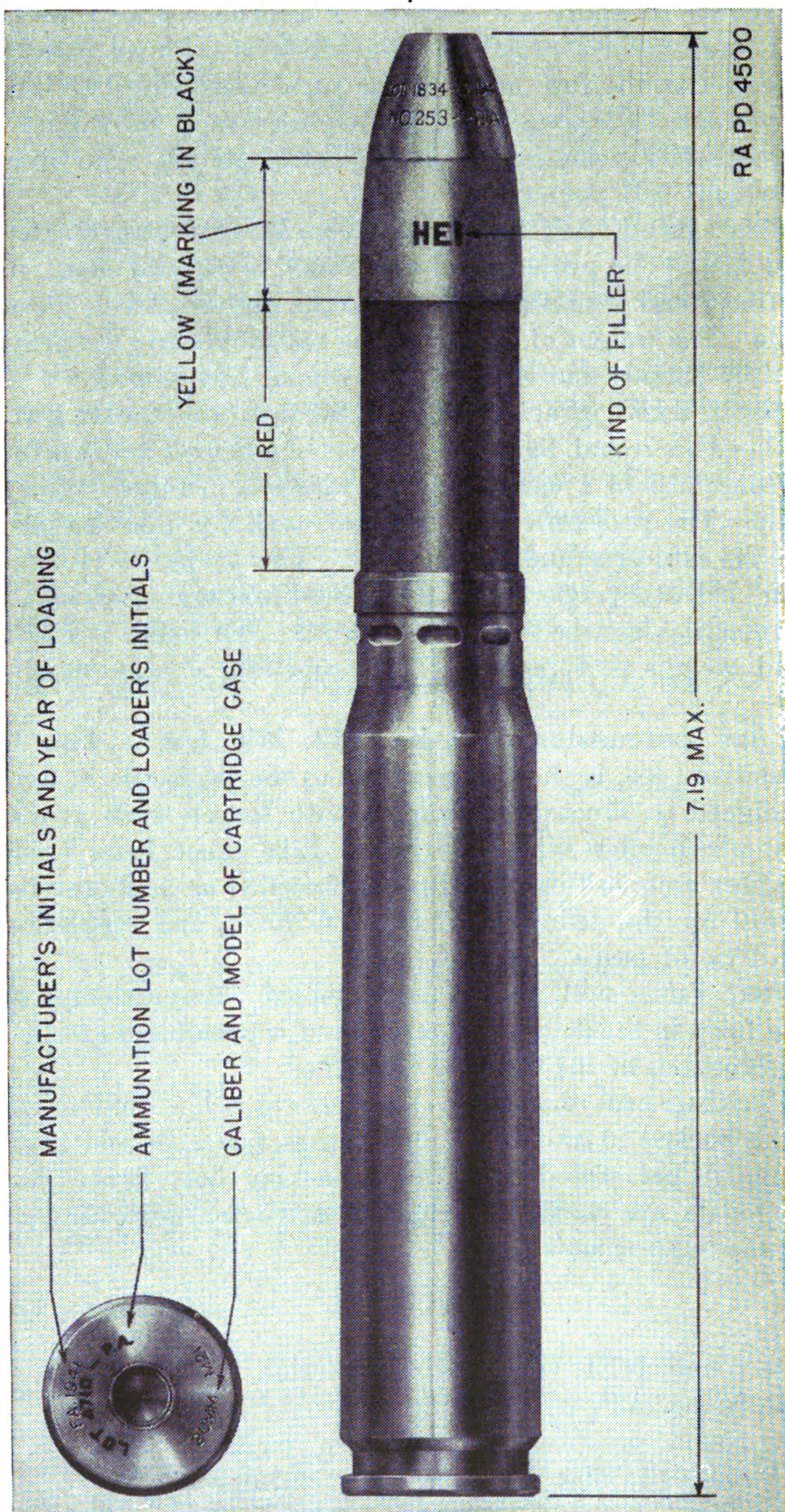


FIGURE 16.—Shell, fixed, HEI, with fuze, DA, No. 253, Mk. I/A/, 20-mm automatic guns M1 and M2.

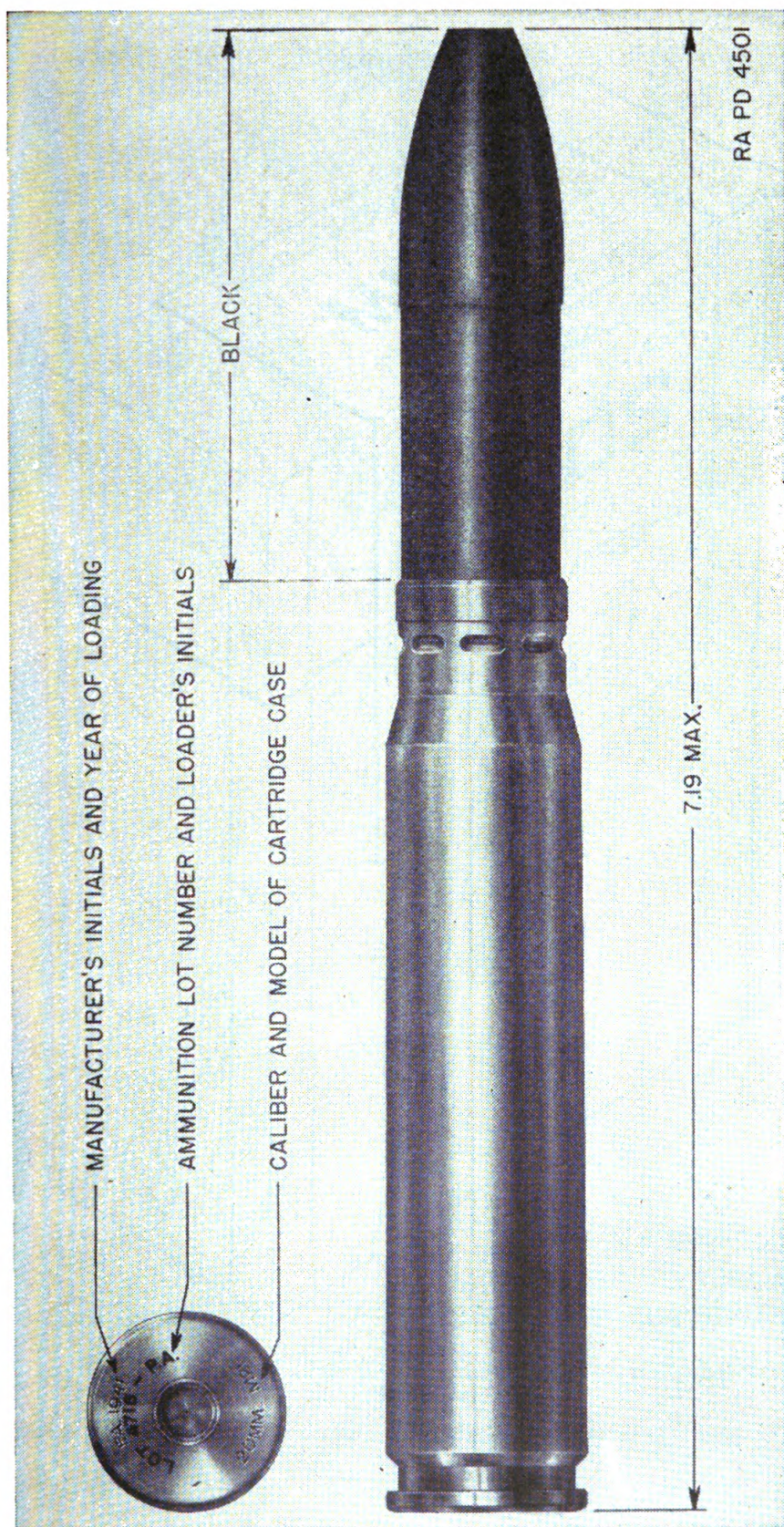


FIGURE 17.—Shell, fixed, practice, Mk. I, 20-mm automatic guns M1 and M2.

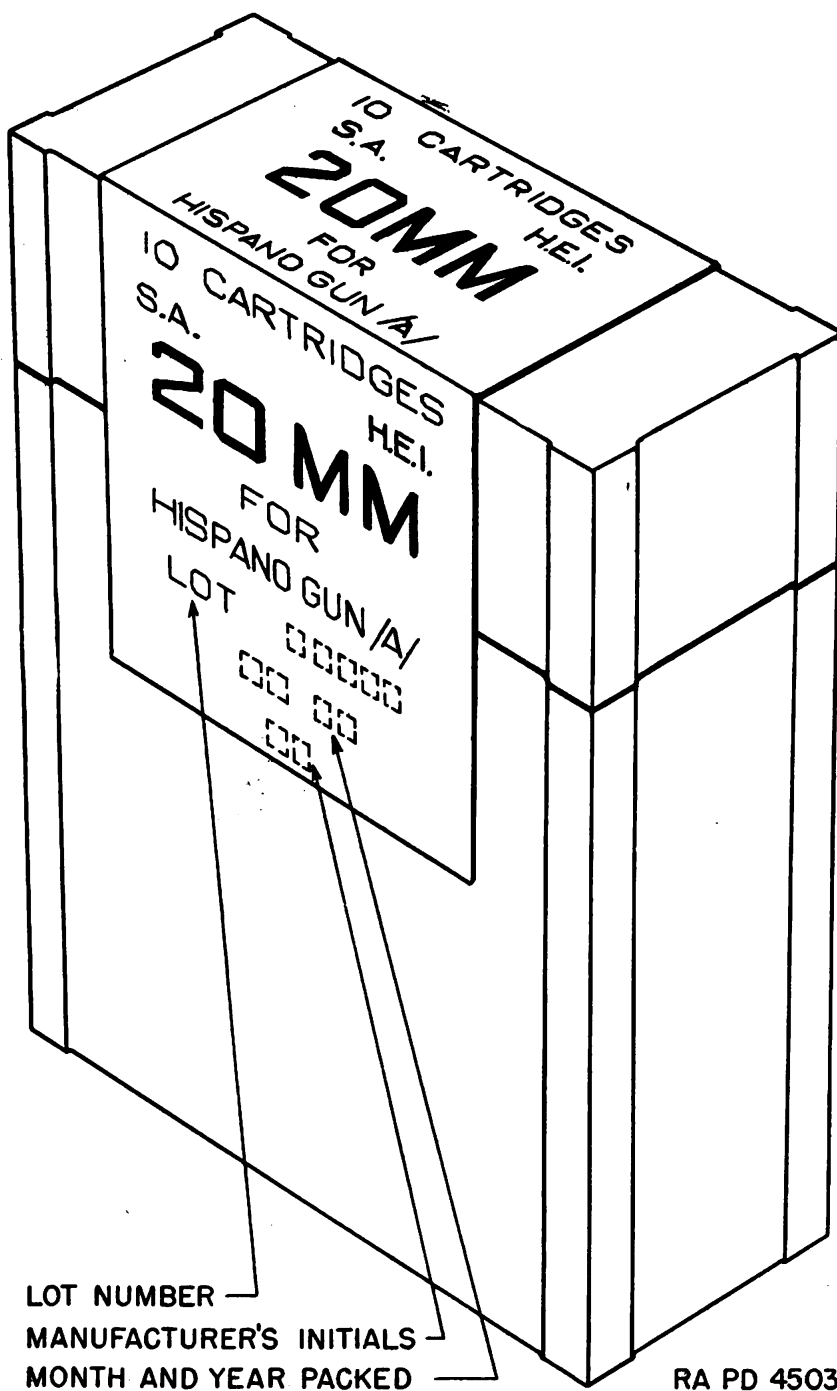


FIGURE 18.—Packing carton and marking for ammunition for 20-mm automatic guns M1 and M2.

NOTE.—Consignor, consignee, and shipping ticket number may be omitted on carload shipment.

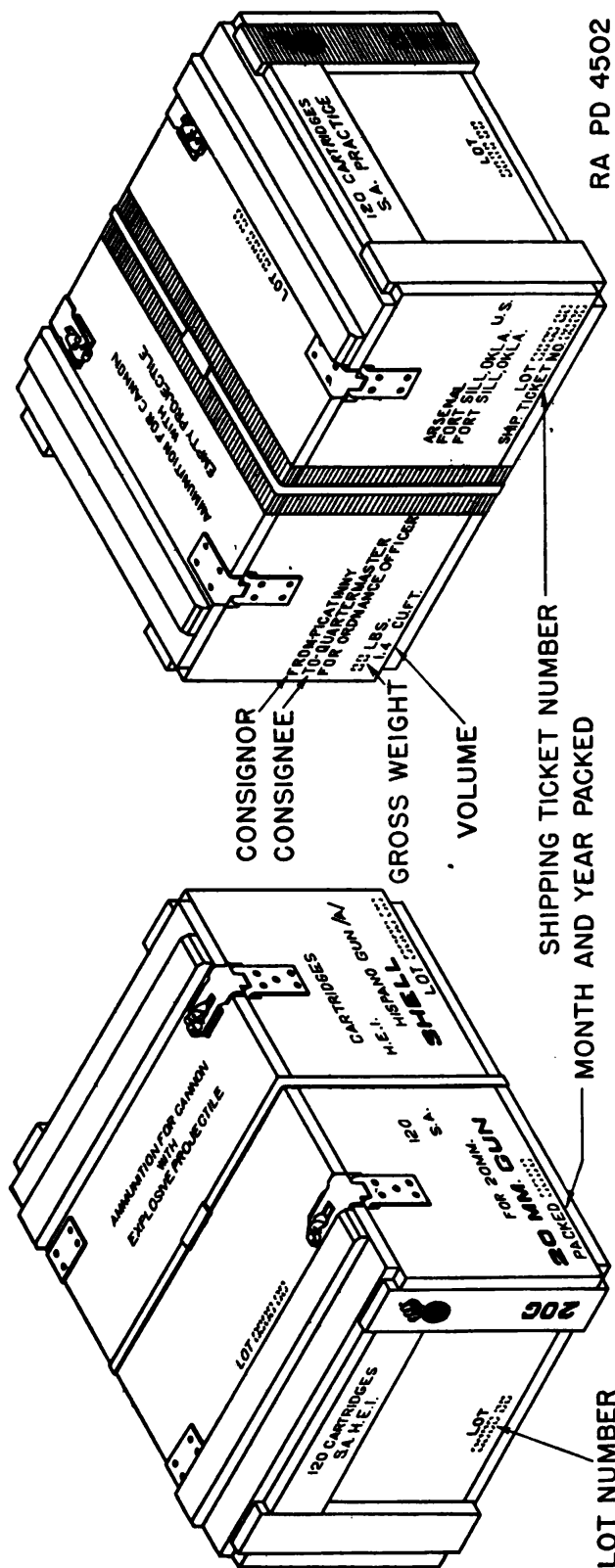


FIGURE 19.—Packing box and marking for ammunition for 20-mm automatic guns M1 and M2.

	Weight (pounds)	Volume (cubic feet)
120 AP rounds in fiber containers in metal-lined packing box-----	103	1.40
120 practice rounds in fiber containers in metal-lined packing box-----	93.3	1.40
Over-all dimensions of the packing box, $17\frac{3}{4}$ by $13\frac{3}{16}$ by $10\frac{1}{32}$ inches.		

b. Marking.—(1) The marking on cartons and packing boxes is shown in figures 18 and 19.

(2) A blue band painted on packing boxes indicates that the box contains practice ammunition.

26. Field report of accidents.—Any serious malfunctions of ammunition must be promptly reported to the ordnance officer under whose supervision the matériel is maintained (see par. 7, AR 45-30).

SECTION VIII

MECHANISM, FEED, 20-MM, M1

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27. General.—There are two methods of feeding the 20-mm automatic guns M1 and M2: the mechanism, feed, 20-mm, M1; and the magazine, 60-round, 20-mm, M1.

28. Description and functioning.—*a. Description.*—(1) Mechanism, feed, 20-mm, M1, can be used with all 20-mm guns M1 and M2. The mechanism is operated by a spring the tension of which is maintained by the recoil of the gun. It is made for either left-hand or right-hand feed.

(2) The belt is made up of links, the loops of which are open at one side to permit disintegration after the round has been withdrawn a distance approximately equal to the width of a link. As the cartridge is disengaged, the link is pushed off sideward. The links are shaped to permit the belt to be made up for either left-hand or right-hand feed. The single loop of the last link in the belt is closed to prevent the link from being caught in the mechanism.

b. Functioning.—(1) The belt feed mechanism consists of an assembly of sprockets on a shaft, the sprockets engaging the rounds in

the belt, and also locating the links axially. As the belt is inserted into the belt guide, the rounds engage the sprockets, causing the sprockets, shaft, driving spring, driving spring hub, and tensioning ratchet to rotate independently of the rack and actuating segment. When two or three rounds have engaged the teeth of the sprockets, the tensioning ratchet pawl will prevent the belt from falling out or being withdrawn. The loading is completed by rotating the tensioning ratchet with a wrench; this tends to wind up the driving spring, but the spring, reacting on the band brake in the spring case, rotates the shaft and feed sprockets to feed in the belt.

(2) As the belt is carried around by the feed sprockets, the cartridges contact a cam surface in the front cover and are pushed to the rear, releasing the rounds from the links. The rounds engage the link ejector causing it to rotate, and the points on the ejector engage the middle of the freed link and push it outward. The double loops bear against the link chute cover spring, which acts as a fulcrum, and the single loop is moved clear of the next cartridge with the double loops of the next link. The pivotal movement of the link is limited, and reengagement of the single loop with the round is prevented by the outward movement of the double loops of the next link. The links then fall away from the link chute. A spring loader plunger holds the link ejector in position ready to be engaged by the next round in the bolt.

(3) When the first two rounds are no longer supported by the feed sprockets they are guided into the mouth by the ramp on the link ejector bracket, having pushed aside the spring loaded feed levers which withdraw the last round retainer. The feed levers are partly returned by their spring and bear on the second round to hold the first round at the bottom of the mouth ready for loading in the gun. Rotation of the tensioning ratchet, after the first two rounds have entered the mouth, winds up the driving spring, the reaction of which, through the medium of the band brake, has a tendency to further rotate the shaft and feed sprockets. The spring is prevented from unwinding by the tensioning ratchet pawl which engages the teeth on the periphery of the tensioning ratchet.

NOTE.—The driving spring can be fully wound without risk of fracture; overwinding of the spring causes the band brake to slip.

(4) When the gun is fired, the breechblock, as it travels forward, strikes the base of the cartridge case in the bottom of the mouth, driving the round into the chamber. As each round is removed from the mouth, the driving spring, through the medium of the band

brake and spring case, causes the shaft and feed sprockets to rotate and feed another round into the mouth.

(5) When the gun recoils, the rack operating lever roller rides up the incline on the front of the magazine slide and lifts the rack, further movement being given to the rack by the incline on the lever. The rack rotates the actuating segment which, in turn, rotates the tensioning ratchet to rewind the spring.

NOTE.—This feed mechanism is spring-operated by the spring tension which is maintained by the recoil of the gun. This means that the gun, besides having to compress its own recoil spring, has an additional amount of work to do. It is necessary to compensate for this additional work so as to keep the recoil stroke of the gun constant. It takes a recoil of about 0.787 inch to operate the feed properly. When using this feed, therefore, the initial compression of the recoil spring should be reduced by the amount necessary to allow the gun to recoil far enough to operate the feed properly. This adjustment must be made for each gun after it is mounted.

29. Operation.—*a. To make up belt for right-hand feed.*—(1) Lay the links along the bench, with their open sides up and with the double loops to the right, the single loops being positioned between the double loops.

(2) Insert a round into the loops and push it forward. The last link, at the left-hand end of the belt as laid out in (1) above, must be of the special pattern provided, that is, with a closed single loop.

(3) Check the position of the cartridges relative to the links. The distance from the base of the cartridge case to the front edge of the double loop should be 3.80 inches.

(4) Test the belt for flexibility by lifting the left-hand loop and drawing it along the back of the belt to the right. Any faulty links will cause the belt to “kink” instead of folding over smoothly. Any link which does not hinge freely must be removed and replaced with another, and the test repeated.

(5) Repeat the above test, starting with the right-hand link and drawing it over to the left. If a stiff link is found, it must be replaced and both right-hand and left-hand tests repeated.

(6) Test the belt for enlarged links by allowing it to hang by one end, and twisting the lowest link until resistance is felt. If the belt breaks, the faulty link must be removed and replaced by another and all tests repeated.

(7) The leading double loop must have a cartridge in it.

b. To make up belt for left-hand feed.—The same procedure is followed as in making up a right-hand feed belt except that the position of the links is reversed. Double loops are to the left, and the special end link is at the right-hand end.

c. To load gun.—(1) Cock the gun and set the safety catch of the sear cover assembly to safe position.

(2) Insert the mouth of the belt feed mechanism into the slot in the magazine slide, allowing the catch plate at the rear of the mouth to rest on the magazine latch.

(3) Press down on the front end of the belt feed mechanism and push it forward to engage the transversely projecting pins at the front of the mouth with the hook-shaped projections on the magazine slide.

(4) Engage the magazine latch with the catch surface at the rear of the mouth. Make sure that the mechanism is properly secured.

NOTE.—The rack roller should be just clear of the bottom of the incline on the operating lever.

(5) Insert the belt into the belt guide of the feed mechanism with the double loop of the link leading, cartridges pointed forward, and open sides of the links toward the mouth. Push the belt in as far as possible by hand.

(6) Turn the tensioning ratchet with a wrench. This action draws the belt into the feed mechanism; two links will be ejected when the belt has reached its proper position. Continue turning the tensioning ratchet until the spring is fully tensioned. This will require two or three complete turns.

(7) The gun is now ready to fire when the safety latch is moved from the SAFE position.

d. To reload gun.—(1) Place the safety lever in SAFE position and proceed as in *c* above. Note that only one link will be ejected, as one round is always retained in the mechanism.

(2) A new belt can be joined to a partly expended belt by removing the special link from the end of the partly expended belt and coupling the two belts together with an ordinary link. Care must be taken to check the position of the round which has been inserted to join the belt.

e. To unload gun.—(1) Set the safety catch to SAFE.

(2) Disengage the magazine slide latch and lift the rear of the belt feed mechanism. Pull the mechanism rearward and remove it from the gun. If the breech is open and the chamber is clear, release the breechblock. If the breech is closed, cock the gun, see that the chamber is clear, and release the breechblock.

(3) Break the belt near the belt guide by withdrawing a round from the links. Remove the rounds from the mouth by pushing them forward with a blunt, wood instrument such as a hammer handle. It may be necessary to apply further tension to the driving spring

during this operation. Do not drop cartridges as they are removed. To remove the last round from the mouth it will be necessary to disengage the last round retainer by operating the feed lever through the link chute.

30. Disassembly and assembly.—*a. Disassembly.*—(1) *Mechanism.*—Remove the three hexagonal head screws, located near the bottom of the front and rear covers, at each end of the mouth. Remove the nuts and lock washers from the tie rods. The front cover and rear cover can be pulled off forward and rearward, respectively. The case will snap outward when the covers are released, and the mouth will drop off. The shaft assembly will remain in the case. Remove the small pins (A25956) which fasten the springs through the case near the rear of the lower right side. The shaft assembly may now be removed from the case.

(2) *Front cover group.*—(a) If the hub, actuating segment, and ratchet have not been withdrawn from the cover on the end of the shaft, they may be pushed out rearward. Remove the hexagonal head screw from the front of the cover to release the rack assembly, rack spring, and rack spring guide, which will be forced from the recess in the cover. Hold the rack in place while removing the screw; then release slowly. Remove the screw slotted plug from the upper side of the cover; this releases the ratchet pawl and ratchet pawl spring, which may be withdrawn. The ratchet pawl retaining screw may now be removed from the front surface of the cover.

(b) To disassemble hub, segment, and ratchet, drive out the pin (A25955) which is located in the smooth cylindrical portion of the ratchet. This releases the hub, and the actuating segment, thrust spring, and driving spring case cover may be withdrawn from the shaft in that order.

(3) *Shaft assembly.*—Drive out the pin (A25950) to release the collar at the rear of the shaft. The rear feed lever, rear feed sprocket, front feed lever, center feed sprocket, and ejector assembly may be withdrawn in that order. Drive out pin (A25950) which fastens the front feed sprocket assembly to the shaft if it is necessary to remove the sprocket. This will release the shaft key.

(4) *Tie rod.*—Withdrawing of the tie rod will release the link chute cover.

NOTE.—Parts riveted at assembly should be separated and replaced by ordnance personnel only.

b. Assembly.—(1) *Shaft and components of shaft assembly.*—

(a) If the front feed sprocket assembly (B163540) has been removed

from the shaft (B163523), it should be slipped on the shaft, located by key (A25942) and fastened by driving a pin (A25950) through the bushing and shaft. Put the ejector assembly (B163533) on the shaft, to the rear of the front sprocket, with the ejector to the left. Follow this with the center feed sprocket assembly (B163539) bushing to the rear; the front feed lever assembly (B163536), last round retainer to the right; rear feed sprocket assembly (B163541), bushing to the rear; rear feed lever (B164518A); and fasten the entire assembly by pinning the collar (A25935) to the shaft with a pin (A25950).

(b) To assemble ratchet, segment, and other components to the hub, place the driving spring case cover (A25936) on the shaft of the hub, followed by the thrust spring (A25973), actuating segment (B163522A), and ratchet (B16351A). Pin the ratchet to the hub with pin (A25955).

(2) *Front cover and components.*—(a) Insert the rack spring (A25971) in the recess in the rack assembly (A25978). Insert the rack spring guide (A25941) in the spring. Place this unit in the recess provided for it in the front cover. Line up the teeth of the rack, front to rear, and fasten it in place with the rack retaining screw (A25966).

(b) Insert the hexagonal end of the ratchet, with parts assembled as in b(1)(b) above, through the central bore of the front cover from the rear. Engage the teeth of rack and segment. *The first tooth on the rack must engage between the first and second teeth of the segment.*

(c) Insert the tensioning ratchet pawl (A25948) in the bore near the top of the cover. Aline the pawl and insert the pawl retaining screw (A25967) from the front of the cover. Insert the pawl spring (A25974) on top of the pawl and close the bore with the pawl retaining spring plug (A25958).

(3) *Mechanism.*—(a) To complete assembly of the mechanism, hook the last round retainer spring (A25972) to the stud on the last round retainer, and the rear feed lever spring (A25968) to the lug on the rear feed lever. Place the shaft and components, as assembled in b(1)(a) above, in the case assembly (D36375); belt guide should project to the right when assembled. Slip the ends of the springs through the small slots provided in the case below the belt guide and fasten with pins (A25956).

(b) Place the front cover, assembled as in (2) above, on the forward end of the shaft, and rear cover assembly (B163531) on the

rear end of the shaft. Compress the case until the tie rods (A25963) can be inserted through the drilled ears of the covers.

NOTE.—One tie rod forms the hinge pin for the link chute cover. It may be easier to attach this rod before the covers are assembled.

(c) Slip the mouth (D36374) into position, the slanted end toward the rear. Compress the case until the edges enter the grooves in the flanges of the mouth and in the front and rear covers. Fasten the tie rods using lock washers (BECX1E) and nuts (A25966), and insert the screws (A25964) and (A25965) at the front and rear, respectively, with lock washers (BECX1G), to fasten the mouth to the covers.

NOTE.—The last round retainer should extend downward within the mouth; the notch in the end of the link ejector bracket should engage the right edge of the mouth; and the rear feed lever should extend downward, to the right of the rear feed lever stop.

31. Malfunction and correction.

<i>Malfunction</i>	<i>Cause</i>	<i>Correction</i>
a. Failure to feed.	a. Insufficient recoil to maintain proper spring tension.	a. Adjust recoil of gun.
b. Failure to feed when recoil is sufficient to maintain proper spring tension.	b. Jamming of cartridge against ramp in front cover—due to improper assembly of belt.	b. Check position of belt links on cartridge.

32. Care and preservation.—*a. Lubrication.*—(1) All moving parts should be oiled through the mouth by inverting the mechanism.

(2) Oil, lubricating, for aircraft instruments and machine guns, U. S. Army Specification No. 2-27, latest issue, will be used for lubricating the belt feed mechanism.

(3) No heavy oil or grease should be used.

b. Cleanliness.—(1) The belt feed mechanism should be kept free from dirt and grit. When it is not in use, steps should be taken to prevent the accumulation of excess dust and other foreign matter in the mechanism.

(2) Before using a new mechanism and after each session of firing, the mechanism should be thoroughly washed out with solvent, dry-cleaning, without disassembling, and oiled as prescribed above. If the mechanism is to be stored the interior and the unpainted surfaces of the exterior should be washed with dry-cleaning solvent and covered with light lubricating oil. The mechanism should then be wrapped in paraffined paper as a protection against moist air.

Use of greases and semisolid rust-preventives will require the complete disassembly of the mechanism for thorough cleaning before use.

SECTION IX

MAGAZINE, 60-ROUND, 20-MM, M1

	Paragraph
Description and functioning.....	33
Operation.....	34
Disassembly and assembly.....	35
Malfunction and correction.....	36
Care and preservation.....	37

33. Description and functioning.—The magazine, 60-round, 20-mm, M1, is an alternative to the mechanism, feed, 20-mm, M1, for use with the 20-mm automatic guns M1 and M2. It consists of the following main parts: front and rear plates with tie rods (through bolts), outer casing, mouth with throat plate, spring and spring casing with front plate disk and tensioning tube, and feed arm axis tube with feed arm bracket, feed arm plate, link, axis bush, and platform tube.

a. Front and rear plates with tie rods.—The front and rear plates are of cast steel and are held rigid against the outer casing by the tie rods, which are secured with single coil spring washers and nuts. On the inside of the plate are spirals which form guides for the ammunition. Tongues and grooves are formed on the edges of the plates for the attachment of the mouth. A hole in the rear plate accommodates the feed arm axis tube, while the spring casing is accommodated in the front plate. A window is provided in the rear plate to enable the ammunition to be inspected during loading.

b. Outer casing.—The outer casing consists of a band, the ends of which fit against the mouth and are held in position by two of the tie rods.

c. Mouth with throat plate.—The mouth is a bronze casting with a tongue at each end to mate with those on the end plates, the mouth being secured to the end plates by mouth pins. Two pins are provided at the front of the mouth to engage the hook-shaped projections on the magazine carrier. At the rear is a catch piece for engagement with the magazine catch when the magazine is in position on the gun. A throat plate is riveted to one side of the mouth to guide the ammunition into the spiral when loading the magazine, or into the mouth when loading the gun.

d. Spring and spring casing with front plate disk and tensioning tube.—The outer end of the spring, which is of clock pattern, engages

a spring anchor plate which is secured to the spring casing by seven rivets. The spring casing is held in position in the front plate of the magazine by the front plate disk, which is secured by seven screws. The inner end of the spring is anchored to the tensioning tube, which fits over the end of the feed arm axis tube and projects through a bronze bush in the front plate disk. Holes are drilled in the outer end of the tensioning tube for the tensioning tube pin and for insertion of a bar. Tension is applied to the spring by inserting a bar in the hole and rotating it in a counterclockwise direction. The pin which connects the tensioning tube to the feed arm axis tube is then inserted, thus transferring the tension to the latter tube.

e. Feed arm axis tube with feed arm bracket, feed arm plate, link, axis bush, and platform tube.—The feed arm axis tube projects through the rear plate and is secured by a collar with pin and washer. The tube is drilled at the other end for the tensioning tube pin. The feed arm bracket is attached to the feed arm axis tube by two taper pins. Grooves are cut in the bracket to accommodate the feed arm plate which extends radially across the magazine. The plate slides in the bracket as the feed arm axis tube rotates, the radial movement of the plate being limited by a stop which is secured to it by two screws. At the end remote from the stop, the feed arm plate is enlarged and drilled for the axis bush of the feed arm link which carries the platform or follower. One end of the axis bush carries a roller which is held in position by a collar secured by a taper pin. The roller follows the spiral as the feed arm rotates, and controls the movement of the feed arm plate in the bracket. One end of the platform tube carries a roller which is held in position by a collar secured by a taper pin. This roller follows the spiral as the feed arm rotates, and the platform or follower supports the last round in the magazine.

f. Functioning.—Initial tension is applied to the spring during assembly, and, when the magazine is to be used, further tension is applied progressively during the loading operations. The tensioned spring, acting through the tensioning tube, feed arm axis tube, and feed arm, maintains the platform or follower in contact with the last round, and insures that a round is always in position in the magazine mouth. As soon as this round is loaded, the next round is brought into position by the spring.

34. Operation.—*a. To load magazine.*—(1) If the magazine has been dismantled initial tension must be applied as follows:

(a) Place the magazine in the holder or other suitable retaining device.

(b) Rotate the magazine until the follower is in the mouth.

(c) Mount the bar through the end of the tensioning tube and turn it in a counterclockwise direction until the spring gives a load of 10 to 10½ pound feet. This requires usually about three-quarters of the turn.

(d) Insert the tensioning tube pin and secure it with a cotter pin.

(2) Using the bar through the hole in the tensioning tube, turn the tube slightly counterclockwise to lower the platform, and allow a round to be inserted.

(3) Insert a round base first into the mouth of the magazine and push it against the rear plate. Ease the bar and insure that the round is in correct position, that is, flush against the rear plate.

(4) Turn the bar slightly counterclockwise to lower this first round, and insert the second round in the same manner.

(5) Repeat this operation until the magazine is full, taking care to insure contact between the platform or follower and the first round inserted. No further tension will be applied to the spring.

b. To unload magazine.—(1) Place the magazine on the holder.

(2) Pass the bar through the holes in the tensioning tube, and remove the pressure from the round in the mouth by rotating the tube slightly, counterclockwise.

(3) Remove the round from the mouth, taking care not to drop it.

(4) To remove successive rounds, gradually ease the bar, removing each round as it is brought into position in the mouth.

c. To load gun.—(1) Cock the gun.

(2) Set the pneumatic sear release unit to SAFE.

(3) Set the firing button to SAFE.

(4) Take a full magazine and engage the two pins at the front of the mouth with the hook-shaped projections at the front of the magazine carrier. Operate the magazine catch lever and press the rear of the magazine into position.

(5) Release the magazine catch lever.

(6) Test the security of the magazine by trying to remove it without operating the magazine catch lever.

d. To unload gun.—(1) Point the gun in a safe direction.

(2) Cock the gun.

(3) Set the safety catch to SAFE.

(4) Remove the magazine by operating magazine catch lever.

(5) Fire the gun.

(6) Cock the gun and fire again.

(7) The gun is now unloaded.

35. Disassembly and assembly.—*a. Disassembly.*—(1) Release the tension from the spring as follows:

(a) Place the magazine in the holder, taking care to insure that the mouth is uppermost and that the nut on lower tie rod enters the locating hole in the holder.

(b) Remove the split pin from the tensioning tube pin.

(c) Place a bar in the end of the tensioning tube and take the load off the tensioning tube pin.

(d) Remove the tensioning tube pin, and, exercising care, release the spring.

(e) Remove the washer.

(2) Unscrew and remove the seven fixing screws and remove the front plate disk.

(3) Remove the spring casing, complete with spring and tensioning tube.

(4) Disengage the outer end of the spring from its anchorage and remove the spring from the casing. Remove the tensioning tube.

(5) Remove the feed arm axis tube, complete with feed arm and follower. To enable this to be done it will be necessary to turn the axis tube through a right angle so that the follower will clear the hole in the front plate.

b. Assembly.—Assembly is in all cases the exact reverse of disassembly.

36. Malfunction and correction.

<i>Malfunction</i>	<i>Cause</i>	<i>Correction</i>
Failure to feed.	Improper placement of rounds in magazine.	See that all rounds are properly positioned with their bases flush against rear plate of magazine.

37. Care and preservation.—*a. Lubrication.*—(1) All moving parts should be oiled through the mouth of the mechanism.

(2) Oil, lubricating, for aircraft instruments and machine guns, U. S. Army Specification No. 2-27, latest issue, will be used at all times.

(3) No heavy oil or grease should be used.

b. Cleaning.—Before using a new magazine and after each session of firing, the magazine should be thoroughly washed out with dry-cleaning solvent, without disassembling, and oiled as prescribed in *a*(1) above. If the magazine is to be stored, it should be washed with dry-cleaning solvent and covered with a light lubricating oil.

APPENDIX

LIST OF REFERENCES

1. **Standard Nomenclature Lists.**—*a. Ammunition.*
Ammunition, fixed, all types, for pack, light and medium field artillery----- SNL R-1
- b. Cleaning and preserving.*
Cleaning, preserving, and lubricating materials--- SNL K-1
Soldering, brazing, and welding materials and related items----- SNL K-2
- c. Gun.*
Gun, automatic, 20-mm, M1 and M2----- SNL A-47
- d. OPSI.*—Current Standard Nomenclature Lists are as tabulated here. An up-to-date list of SNL's is maintained as the "Ordnance Publications for Supply Index". OPSI
2. **Technical Manuals and Army Regulations.**
Ammunition, general----- TM 9-1900
Range regulations for firing ammunition in time of peace----- AR 750-10
Cleaning, preserving, and lubricating materials--- TM 9-850
Ordnance field service in time of peace----- AR 45-30
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DISTRIBUTION:

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(For explanation of symbols see FM 21-6.)

